

this Way they will breed to the fullest Advantage.

CHAP. XXIX.

Of the breeding of Poultry.

THE Yard being thus stock'd with these Poultry in proper Number, of the fittest Kinds, and with the choicest of the Breed, the Farmer is to consult the managing them to the best Advantage for their Breeding.

The Age is a considerable Article in this Respect; and he is to be very careful in suiting their Employment to that: for it would be very ill Husbandry to stop the profitable laying of a young Hen, by setting her upon her first Eggs, when there are such as are fit for nothing else, and will do this better.

As the youngest Hens are always the best Layers, and those advanced into Years are the best Sitters, let these be managed severally accordingly. And in both these Respects the Farmer is to have Regard to the feeding: for any Extream is equally wrong, whether in Excess, or in Defect. If they be starved or kept too low, they will want Strength and Spirits; and if they be fed too high they will grow fat. A fat Hen is always lazy, and will never lay well, nor sit quietly. The feeding them moderately while laying, or while sitting, is the right Method.

The best Season of the Year for Hens sitting, is Spring and Summer; the earlier in Summer the better, and the first Months of Spring best of all. MARCH is the best Month for Chickens to be hatch'd, and the Middle of that Month is the most favourable Time of the whole Year. The Hen sits only twenty Days, so from this Account it will be easy for the Husbandman to know when to put her upon the Eggs for the best Brood; that is, in the last Week in FEBRUARY; and from that Time he may continue breeding till the first Week in OCTOBER.

The prudent Husbandman should never set a Hen that is less than two Years and a half old; from this Time to five, or between five and six Years is the best Time of that Creature's Life for sitting, and producing Chickens. The finest Broods will be obtained when these two Considerations are regarded together; that is, when a Hen of a good Breed, and of about three Years old, is set in the Middle or End of FEBRUARY, upon a Parcel of well chosen Eggs laid by a young Hen of a good Kind also, who has let no Cock come near her but her own, that the Breed may be kept entire.

We have observ'd, that in order to the having a due Quantity of Eggs, the Hen that lays must be kept moderately: she must be fed so as to have Health and Vigour, and not to grow fat; but there is something to be said for the Kind of Food, as well as the Quantity.

The Pretences of increasing the laying of Hens by particular Diet, have been slighted by some; but they have been since confirmed upon the repeated Trials of others, and no Argument can

stand against Experience. Many Kinds of Food have been prescribed for this Purpose, but there are two most authorized by Experiment, these are Buckwheat and Hempseed: the Effect of these is equal in Respect of laying; but the one fattens at the same Time the other does not, therefore the Condition of the Hen is to fix which is preferable.

If she be inclined to fat, then Buckwheat must not be given, because while it tends to make her lay by its common Virtue, it will also increase her fat so as to take her off: in this Case Hempseed is the proper Kind. On the other hand, when a Hen is poor, the proper Kind is Buckwheat, for at the same Time that it inclines her to lay, it gets her into Flesh.

As to the Number of Eggs to be put under a Hen for setting, there have been different Opinions; but by what I have found from many Trials, the best Number is seventeen. Let Care be taken that they be fresh and sound Eggs, and let the upper Side of every one of them be mark'd blue; when the Hen gets from her Nest for feeding, or washing herself, let the whole Number be carefully examin'd to see if she have turn'd them all, or any of them. Such as she has not turn'd, the Owner must see turn'd for her. And from this he will know how to value her for setting afterwards; for the Hen that turns all her Eggs herself, is greatly preferable to those negligent ones which omit that needful Caution.

Every good Housewife knows how to judge of the Newness and Soundness of her Eggs by holding them up to the Light, and seeing that they be full and clear. This is never so necessary as in the Choice of those Eggs which are to be set for hatching.

When a Hen is set, she must never be disturbed against her Will; and some Care must be taken to set her Food and Water. If she be put from the Nest against her Will, she often forsakes it entirely; and if she be obliged to go to seek for Food and Drink, oftentimes she is obliged to be absent so long in the Search, that the Eggs chill, and the Chickens are killed in them.

This Care is needful during the whole Time of her setting, but is most of all to be strictly observed toward the End of the Period. The Chickens are then formed in the Eggs, and they require the constant Warmth of the Creature's Body to keep them alive, a small Time of chilling will utterly destroy them.

When the Hen rises from her Eggs, especially at these Times, to feed upon what is set before her, the Person who has the Care of her, should stir up the Straw of her Nest, and lay the Eggs regularly together, that she may find all convenient and agreeable at her Return.

The Cock is also to be watched upon these Occasions, for when the Hen is off her Nest, he will offer his Service to set for her, but he does this very awkwardly, he frequently breaks some of the Eggs, and the Hen is always displeased at it. Sometimes she will entirely forsake the Nest upon it.

In the Choice of Eggs for setting, if there be any larger than usual, they are to be rejected, for

for they will not lie even, and will cool those that are next them. These often have a double Yolk, and they are the Eggs which commonly produce those monstrous or misshapen Chickens, which surprize the common People, among the Broods of this Creature.

As nothing more is requir'd for the hatching of Chickens than a due Degree of Heat, there has been long a Custom in *Ægypt*, of hatching them without the Help of Hens, in Ovens, by Means of a small and regular Fire. They in this Manner produce vast Broods at a Time. This Custom has of late been attempted to be brought into *Europe*; in *France* the celebrated Monsieur de *REAUMUR* has made many Experiments, and at length with some Success. From the publick Account he gave of this, the same has been attempted in *England*, and among other ingenious Persons, the Honourable Mr. *STANHOPE* try'd it, and succeeded: but there does not seem any Probability of its being brought into common Use; and indeed so much Nicety is required in the Thing itself, and such a great deal of Care of the Chickens after they are hatch'd, that it appears rather fit for an Amusement for the Curious, than an Employment for the Husbandman. We have seen that it may be done; and that is all that 'tis worth our while to regard about it.

If it happen that a Hen dies, or a Brood become by any Accident Motherless, the best Method is to mix them among the Chickens of another Hen that are about the same Age, and she will take Care of all together. A Hen may thus be brought to conduct and assist three or four Broods: and this is the most favourable Circumstance concerning the hatching of Eggs by Art; but there is a Limitation in the Number; and at present the Attempt is not to be recommended to any on the Foundation of Utility or Profit.

Although we have fixed the setting of the Hen to the Summer and Spring Months, it is not to be understood that they will not set at other Times. Eggs may be put under them at any Season of the Year, and they will hatch them; and for those that chuse to bestow a sufficient Time and Attendance upon them, the Winter Broods may be worth raising, for they bear the best Price when they are grown up for Sale in Spring. This, however, requires more Trouble than the Husbandman can well bestow upon so small an Article in his Stock; and therefore it is we have recommended the setting of the Hens in the End of *FEBRUARY* to any other Time; for a Brood of *MARCH* Chickens will be worth near twice as much to him in this general Way, as those of any other Time.

When the Breed of Chickens is the only Care, the white Fowls with white Legs and white Beaks are to be prefer'd to all others, because of the Whiteness and natural Tenderness of their Flesh, and their Price on that Account in the Markets: but these are not the best Layers.

Therefore if Eggs be the principal Care, the red Cock and mottled Hen are to be prefer'd.

If a Hen that has been fed with Buck-wheat to make her lay frequently; grow too fat upon

that Diet, she must be fed with Oats: for they at the same Time that they take down her Fat, assist her breeding of Eggs.

In all these Articles of feeding, it is not intended that the Fowl should be kept upon those Things entirely. She should be left to take some Care of herself abroad, for her stirring about will do her Service; only what Addition to her natural Food is requir'd to keep her in Health and Strength for laying, should be of these Kinds.

C H A P. XXX.

Of the bringing up of Chickens.

WE have led the Husbandman, or rather the good Housewife, (for this Care naturally falls upon her) from the Purchase of the Stock in this Kind, to the hatching of the young Brood: these are the most essential as well as the most valuable Articles that falls under this Head; and we shall therefore lay down such Rules for the breeding them up to the Condition for Market, as Experience has shewn are the most useful.

We have mention'd twenty Days for the Time the Hen sets: this is the earliest Period at which an Egg hatches, and as some are longer than others according to the Thickness of the Shell, their Place under the Hen, or other Accidents, they sometimes are one and twenty, and sometimes two and twenty Days.

In this, Patience is the Remedy. There have been several Ways proposed of assisting the Hen in hatching, and the like, but they are foolish and unnecessary. All is to be left to Nature.

In large Broods especially, it often happens that some Chickens are thus hatched a considerable Time before the others, often one, and sometimes two Days. In this Case let the Hen be watch'd to see how she treats them, for if she be careful, nothing better can be done than to leave them with her. But if she be restless, and seem troubled with them, it will be best to take them away.

In this Case let a little Wool be put into the Bottom of a Sieve, and let them be set in the Reach of the Warmth of the Fire, if the Air be chill; and thus nursed up till the Hen has hatch'd the rest, and can take them under her Care. During this Time nothing is needful but to keep them warm, for the Chicken in the two first Days requires no Food.

For the first feeding of the Chickens, the best Thing in the World is a Mixture of white Bread Crumbs and small Oatmeal. Let a Quantity of these be mix'd well together, and then put a part of it to steep in Milk, and keep the rest dry. Give the Chickens a little of each Sort at Times, as they follow the Hen.

After they have thus got a little Strength, they are to be fed with Bread steep'd in Milk, and then with Barley-meal and Cheese-parings cut small, and the like, and the Hen will by this Time greatly assist in the providing for them, tho' at the first she can do little more for them, than the keeping them together, and nourishing them by her Warmth.

In cool Weather it is always best to keep young Chickens within Doors, till they have got some Strength. At the worst Season, during the Months we have recommended for breeding these Creatures, they need not be kept within Doors above ten or twelve Days, after which they may be suffer'd to go about Abroad with the Hen; and in the better Seasons, the less of this keeping them within will be necessary; often scarce at all.

It is a very material Thing to let the Chickens, while they are young, have good Water, for they fall into half the Diseases to which they are subject, from the being obliged to drink such as is foul, or any thing they can get at.

By Means of the Food we have directed for young Chickens; and the giving them Bread, scalded with Milk, and some Barley Meal afterwards, they may be fatten'd up while they are under the Hen. This is a very common Practice in IRELAND, and according to the common Error of Expression in that Country, they call these sucking Chickens.

The most general and useful Time of fattening them is, at a somewhat more advanced Growth. To this End when the Hen forsakes them, which she always does as soon as they are fairly able to provide for themselves, they should be taken up and put into Coops, in a darkish Place, and there fed for fourteen or fifteen Days. Their Quietness assists greatly to the fattening of them; and they will always be most quiet where they have least Light.

In these Places they are to be fed in the Manner that is called cramming, and the best Food is ordinary Wheat Flour, made into a Paste with Milk. This is to be soak'd in Milk, and then broke into small Pieces, which are to be put down their Throats, always wetting them well in Milk first, that they may go down easily.

Some prefer Barley Meal to Wheat for this Purpose; and others speak greatly of the Meal of Buck-wheat: but from many Tryals it appears, that Buck-wheat Meal does not answer well alone. A little of it mix'd with the Wheat Flour before it is made into Paste, may do very well; but too much is not profitable.

There is one Article attending this Manner of fattening Chickens for the Market, which ought to recommend it greatly to the Husbandman, that is, the Advantage of their Dung. The Price they bring at Sale will very well pay the Expence and Trouble of this Way of feeding them, and he has this Addition to the Profit. We have mentioned, in its Place, this Article of the Dung of Poultry, and here it has a great Advantage, as it is naturally collected together, and he may use it before it has lost any Part of its Virtue, by being exposed to the Air.

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## C H A P. XXXI.

### Of Capons.

**T**HE Capon which, when properly managed, is a delicate Bird, and brings a good  
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Price, is the common Cock gelt, and fed properly.

The Time for gelding the young Cock is either as soon as the Hen has left the Chickens, or if the Testicles be not, at that Time, come down, he is to be watch'd, and to be gelt as soon as he is heard to crow; for at this Time the Testicles are always easy to be found.

The Art of Gelding, which by a peculiar Term is called Carving, has nothing particular or difficult in it. The Testicles are to be cut out, and the Wound heals of itself without any Kind of Trouble.

The Hen being spay'd fattens in the same Manner, and with the same Management becomes a very fine Fowl.

The Capon being naturally inclined to fatten, will grow to a fine Size and delicate Flesh in the Yard, and at the Barn-Door, without any particular Care or Trouble: if some Meat be given him additionally to what he thus picks up, he will come into good Case the sooner, and thus be very well fitted for the Table; but in order to make him bring the largest Price at Market, he is to be cram'd in the Manner of Chickens. This makes him grow, in a little Time, to a great Bulk; and makes his Flesh very delicate.

In order to cram Capons, let them be taken up and kept in a small, quiet, dark Place. Where they are to be fed in the Way of the Chickens, and their Dung is to be sav'd in the same Manner, it being of equal Value.

The best Food is found to be Barley Meal, mix'd with Milk into a Kind of Paste: this is to be of a moderate Stiffness; and is to be shap'd out into long Pellets, which they call Crams, largest at the Middle, and smaller at the Ends; these are to be wetted in warm new Milk, to make them go down easy; and he is to be fed, with them three Times a Day: this is to be continued eighteen or twenty Days, and he will then be a fine Creature.

Regard should be had to the Dung, not only for its own Value, but for knowing the Capon's Health. The general Rule is this, the finer the Meal be sifted the sooner it passes through him: so that by this Means only, of giving it finer or coarser, he may be kept in a proper Condition during the whole Time of his cramming.

If the Husbandman live at a Distance from any large Town, or where there is not a Demand for Capons for the Table, it will not be worth his while to cram any; but still he ought to breed some always among his Stock, because they will come into a very good Condition for his own Table, by feeding in the Yard among his other Poultry; and they may also be put to a very considerable Use, in the bringing up Broods of Chickens, or any other Kind of Poultry. The Capon is to be tricked into this at first; but when he has once well taken to it, he will be vastly pleas'd with it; and will discharge his Duty like a Mother.

For this Purpose, the large Bulk, and soft Flesh of this Fowl is an Article of great Advantage, for he is able to cover a larger Number of Chickens than an Hen can, and he will keep them warmer.

The thing that tempts the Capon to take this  
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Charge upon him, is the Pleasure he has in feeling their soft and tender Bodies; and the good Housewives having found this out, use a Method to make it more comfortable to him, by purposely putting him to pain, that he may want it.

To this Purpose they sting the Breast and Belly of the Capon with Nettles, pulling away a Part of the Feathers for that Purpose: they do this toward his roosting Time, and then in the Dark they put the young Brood under him, the Warmth of their Bodies allays the itching, and when he sees them in the Morning he takes to them, and will lead them as naturally as a Hen.

The Care of the Capon, in this Instance, is not limited to Chickens; for he will, in the same Manner lead young Turkeys, Peahens, Pheasants, Ducks, or Partridges, and will be better to them than their natural Mother, fighting any of their Enemies, and sheltering them under his Body on every Occasion. If he grows negligent of them before they are fit to be left to themselves, the Method is to sting him again, and he will take to them as naturally as at first. Some scratch the Capon with Briars, or prick him with Furzes, to this Purpose, but these are more cruel Ways, and do not answer the Purpose like the stinging.

Before we close this Head of Fowls it may be proper to give the good Housewife one Caution about the collecting of her Eggs, especially when she has a large Stock of Poultry. The Eggs should be taken out of the Nest every Day, and the proper Time is the Afternoon, when every Hen has left them. The Nest Egg is always to be left, but never any more; and in the Place of a Nest Egg, some cut a Lump of Chalk into the Form, and it answers the Purpose.

Many Hens make such a cackling as soon as they have laid, that the Housewife may be assur'd by that, of her Time to go and take their Eggs, but they do not all do this: some make no Noise; so that the best Way is to have one Time of the Day to go the Rounds when every Hen is off, and collect all the Eggs together.

The Preservation of Eggs for their keeping a long Time, is a thing that has employed the Thoughts of many, and a great Number of Methods have been proposed, many of them idle enough, but some useful. They have been laid in Straw and in Bran, but the first keeps them too cold, and the latter too hot. The putting them up in Malt has been found preferable to either of these. But the best Method is by dipping them in Fat.

The Way that an Egg spoils is by the wasting of its Moisture through the Shell, and this is prevented by any thing that will stop up the Pores of the Shell. No Method is found to answer this End so well as the covering them with some fatty Substance; and the best Way of doing this is by melting a Quantity of Fat over the Fire, and dipping the Eggs in it. They will bring away so much as will cover the Shell sufficiently for this useful Purpose.

We owe this Invention to the FRENCH, and it has been discover'd by their Philosophers; for in that Country the greatest Men are not ashamed to meddle with the meanest Subjects that can be of publick Utility.

## CH A P. XXXII.

### *Of Turkeys, their Kinds and Choice.*

THE Turkey is a very large and fine Bird, and exceedingly well worth the Regard of the prudent Husbandman. There are Advantages and Disadvantages attending upon the raising of this, as other Kinds of Fowl; but all being weighed together, the former far outweigh the latter, and the Interest of the Farmer will lead him to think very seriously of receiving them as a Part of his Stock.

There is also this farther Encouragement to his Industry, that a great many of the Disadvantages attending the keeping of this Fowl, may be remedied or prevented by prudent Management: and that there is no kind among all the Poultry which will afford so many Opportunities of Improvement. There are several Breeds of the Turkey, much more different than those among the Cock and Hen Kinds; and the properly chusing among these, will greatly add to the Profit and Ease of keeping them.

Among the Advantages of the Turkey may be reckon'd his Size, the Price he fetches at Market when in good Condition, and the Quantity of his Dung, which is as valuable as any other Kind whatsoever. He is fit for Sale also in the common Condition at a good Price; and his Feathers are not to be neglected, in counting up these Benefits.

Among the Disadvantages of Turkeys are to be reckon'd their straggling Disposition, their being liable to many Accidents, the Difficulty of raising them, and the frequent Destruction of them by Vermin; as also the Quantity of Corn they devour. If fed altogether with this, they will eat more than they can ever be worth; but to this it may be answer'd, that the feeding them with Corn is not necessary, for they will in general provide very well for themselves; and in the same Manner we shall shew that every other Objection made against them may be removed: and that it will be greatly to the Farmer's Advantage to raise them in most Places.

This Kind of Bird always succeeds best for the Owner in open Countries, because these are not so much infested with Vermin: and they are subject to ramble and to be destroy'd more than any Kind, as observed already. This may be a very reasonable Caution for the Husbandman not to keep them in improper Places; but we have Counties enough in ENGLAND that are not at all liable to that Objection. We have often told our Pupil in these Studies, that he is to suit his Stock to the Nature and Circumstances of his Farm; and this is only one Instance of that general Necessity.

There are several smaller Differences among Turkeys, respecting Colour and other Accidents; and there are Distinctions of more Consequence, as they depend upon real Differences in the Kind. Among the common Breed of Turkeys there are two Sorts distinguished by their Colours, a whitish or grey, and a darker. These differ in many Respects: but the principal is this, that the white Kind breed excellently, but they

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are tender, and the others require less Care, but they do not raise so many young.

It is a Thing remarkable in all the Turkey Kind, that they take very little Care of their Brood: but these least of all. If a common Turkey, of the white Kind, have a large Number, she will never miss half of them, so the rest keep about her; but among the black Kinds, if a single young one follow the Hen, she never thinks of the rest, if they be all lost; and even this Straggler she will drop with very little Regard or Notice.

The Farmer is therefore here directed in part in his Choice. If he intend to bestow a great deal of Care upon his Turkey, the white Kind are to be prefer'd, for they breed the best; but if he cannot bestow so much Time upon them, let him chuse the black: all that is necessary about these is to see that they are not deserted while they follow the Dam, for after this they will take Care of themselves.

There are Turkeys much more different from these than they are from one another. Of these the wild Turkey of VIRGINIA is the most valuable: this is large and dark colour'd. There is also a smaller wild Kind, of a dark Colour, that is much hardier. Either of these may be raised by the Farmer; or he may mix the Breed by coupling one of our common Turkey Cocks with a Hen of one or other of these Kinds. The ENGLISH and VIRGINIAN Turkey make a very good Breed, as has been found long since by Experience. The young from this Mixture are hardy, and will soon take Care of themselves; and they are larger, and every Way better than the common Breed: they will raise their young ones with Care in the Fields, and bring them in at an Age when they can shift for themselves.

Whatever Breed of Turkeys the Farmer shall, according to the several Circumstances of his Situation, prefer, let him take Care to chuse for that Purpose such as are good of the Kind; and particularly the Cock. He must be a tall, stout, lusty, and spirited Bird. The Turkey is naturally stately and majestic; and the Cock that is chosen for the Breed ought to be so particularly. For if he hang down his Head and look peaking, he never will be good for any Thing as a Father for the Brood. The Hen should be large and vigorous; and it is a general and true Observation, that such as are tamest are the best for the Care of their young.

### C H A P. XXXIII.

#### *Of the breeding and raising of Turkeys.*

THE first Article to be consider'd in respect of the Breeding of Turkeys is the Age of the Cock and Hen. The Cock must be young, for the Brood is never good unless he be in the Vigour of his Life; the Hen may be older, for her Care in sitting and leading them is all that is requir'd of her, and in the latter Article the Cock often assists her, when he is of a kindly Sort.

The Turkey Cock for Breeding, should be about two Years old; and the best Time for

the Hen is at about four Years: she may be employ'd in breeding till she is six; but when she is too young, she is most apt to neglect the Brood; and when the Cock is at all declin'd from his Strength, they are weakly.

Turkeys are not natural to our Kingdom, and there is therefore always a Wildness about them. The Female of this Kind does not lay familiarly and conveniently about Houses as the common Hen, but rambles to a Distance, and makes her Nest among Thickets: for this Reason her Brood is from the Beginning more liable to Accidents. The Farmer must therefore be watchful about the Time of her laying, and take Care to get her into the Hen-house, and compel her to lay there: for this is the first Precaution, and it is a very essential one about the Brood.

It is a Custom with some, if there be Convenience of Thickets, or a little Wood near the House, to let them take their own Way, and lay and sit there; and in the hardier Breeds, with a little Care of the young when new hatch'd, this will do very well; but there is never any Harm in the other Method, whatever be the Breed; and there is a much greater Certainty of Success.

The Turkey naturally begins to lay in the Month of MARCH, and will sit in APRIL. The Eggs are very large, and are excellent in the way of Food, particularly they have a restorative Virtue.

The proper Number of Eggs to let the Hen sit upon is eleven, some advise thirteen, but commonly there is less Success in that avaritious Method, for they cannot be all well cover'd.

It may be observ'd, that in talking of the Quantity of Eggs to put under a Hen Fowl of any Kind for setting, we generally speak in odd Numbers, as eleven or thirteen, not naming ten, twelve or fourteen. The good Housewives have been taught from Generation to Generation, to put always an odd Number; and tho' they know nothing of the Reason they practise it superstitiously: the Occasion is, that an odd Number will lie better, and in a more compact Heap, when we come to such Quantities as are usually set, than an even. This is owing to the Shape of the Eggs, and is a Fact any one may see on Trial; and on this is founded that old Maxim.

The Turkey sits about seven or eight and twenty Days. Some of the Eggs will sometimes be hatch'd at five or six and twenty, and some will lie till thirty, but the middle Time is the most natural.

The hatching of the Brood is the Time when the great Care is requir'd in their Management. The Turkey being naturally a Bird of a warmer Climate, is chill in this; and particularly the tender young. They must be kept very carefully at first, especially such as happen to hatch before others of the same Brood: the best Way is to put them into a Basket with Wool in it, and set them before the Fire, at such a Distance as to be gently warm'd.

From this Time the Farmer is to depute some body to act as a Parent for them, for the Hen is not to be expected to do much: they will follow her, and should be permitted to do so in the



the warm Part of the Day, and she should be manag'd to take Care of them. The Cock also will often watch over them, keep them together, and defend them better than the Hen; but neither are to be trusted without careful looking after.

The proper Method of managing them is this. They are to be kept in a warm and close Place altogether while they are very young; and when they have got some Strength, they are to be let out two Hours after the Sun is up in the Morning, and taken in again before he sets in the Evening: and in the mean Time they should only be let into some walled Place, or some Inclosure so secure that they cannot stray.

At first they are to be fed in the House, and afterwards in this open Place: and at all Times they must be allowed a sufficient Supply of Food, for their Parents take at best but little Care to help them to any. The very best Food for them is green fresh Cheese, and while they are young, their Drink should be only new Milk; afterwards Milk and Water, making it weaker and weaker till they come to Water alone, which they will then drink wherever they can find it. Curds are a very good Food for them, but not so well as Cheese. A very wholesome Food also is a Kind of thick hasty Pudding made of Oatmeal, Water, and a little new Milk among it.

As the Tendernefs of the young is one great Article in the Disadvantage of the Turkey; indeed the greatest, Care must be taken that the Hen do not set herself at too early a Season. If the young are hatch'd in cold Weather, it is scarce possible to rear them without considerable Loss; but if they be produc'd toward the latter End of May, which indeed is the most natural Time, as well as the best, they will have a much better Chance.

It is only while young that this Bird is so exceedingly tender; for, when grown up, it will bear the coldest of our Weather very well. Grown Turkeys will stand our severest Winter Nights exposed, better than our common Fowl. They are frequently subject to be lost while young, by straggling from the Dam, and one another, in which Case they become an easy Prey to any Kind of Vermin; but it is only while they are young that they are liable to this; for, when grown up, they are not only strong enough to defend themselves; but they always love to keep in Flocks together.

The Husbandman who keeps many Turkeys, must take a great deal of Care to keep them out of his Garden, for no Bird does so much Mischief there: but their Profit is very well worth the Trouble they occasion in this and other Articles.

When the young Turkeys have by the Means already directed, been raised to some Strength and Bigness, they may be left to themselves. They had Reason to complain of the Expence of keeping these Fowls, who feed them constantly with Corn, from the Time of their first eating dry Meat to the fattening of them; for they are very great Devourers: but we find by Experience, there is no Occasion to feed them at all, either with that or any Thing else, till they are

to be got ready for Sale. They will at all other Times take sufficient Care of themselves, and keep in very good Case with what they find under Hedges, and in the Yard.

They are naturally in better Case in Winter than in Summer; for they are an indolent Bird, but the Cold gets them a Stomach: and this is the best Time for fattening them for the Market.

In order to do this they must be taken up and housed; but it is best not to keep them up entirely, for they will in that Case lose their Food, and come on poorly. They must therefore be let out the greatest Part of the Day, but it is best to keep them where they cannot run much about at these Times. The Food to begin fattening them with is good Barley, boiled till it is soft: Oats will do; but the Barley is found better. Let them have Plenty of this for a Fortnight, with some Air and Sunshine, but a great deal of Rest. After this they are to be cram'd every Morning as Capons are, with a Paste made of Barley-meal and new Milk; this is to be made into long Pellets, and wetted in warm Milk to make it go down. They are to be well fed with this in the Morning, and then suffer'd to go out, but they are to be kept as quiet as may be. They are not to be cram'd any more each Day, beside this Morning feeding, but during their being out, Corn is to be thrown to them at Times: this will keep them eating, and keep them quiet, for having Food thus before them, they need not ramble about to seek it; and thus they will in a little Time fatten up in a very fine, and even a surprizing Manner.

This is their proper Management from the Egg to the preparing them for the Market; in which it is plain, that all the Disadvantages supposed to attend them, may very easily be obviated and prevented; and that all the Care that is needful about them is, when they are very young, and when they are preparing for the Market: at the first of these Times the least Cold kills them; and at the other, they will not fatten well unless carefully tended: all the rest of their Lives they provide for themselves; and the Price they bring, whether sold as Poults, or when grown up and fatted, is so considerable, that it very well answers all the Trouble.

#### C H A P. XXXIV.

##### *Of Geese; their Kinds, and the Profits of keeping them.*

THE Goose is a Fowl different in its Nature and Qualities from the Hen and Turkey, they living on Land only, and this, though in a great Measure on Land, yet a Part of its Time in the Water; for which it is qualified by the Nature and Make of its Feet contriv'd for Swimming.

The Husbandman will therefore find it needful to consider, in order to his determining concerning this Article in his Stock, how he is situated with Respect to Water. Of the several Water Fowl that are bred tame, the Goose is least



least devoted to that Element, as it walks the best of any of them on Land, and finds the greatest Part of its Food there. We see also that Geese will live where there is but little Water; but let not this mislead the Farmer into an Opinion, that this Element is little needful to that Fowl, for tho' they will live where there is but little, they always thrive better where there is more.

The Husbandman is to consider, when he is about to raise his Stock, what Kinds suit him best according to the Nature of his Situation; and from this he is to be led in his Choice which to have in the greatest Number. I would advise the Farmer, where he has but little Water, to breed some Geese; but where he has much of it, only to fall greatly into that Way.

Some may fancy it less worth while in any Case to be very careful about these Fowls, because their Profit is less than that of the Hen or Turkey; but the Trouble requir'd about them is also less: and their Value is not so small as some affect to make it. They are sold at a good Price in Spring when they are young, and in Autumn when full grown; and beside this, there may be a very great Profit made of their Feathers: many Millions of Geese are raised in some Parts of this Kingdom for no other Use whatsoever; and the Profit is found sufficiently considerable.

I would therefore advise the Farmer who shall be conveniently situated for the breeding of Geese in Quantities, to look upon them as an Article of some Consequence in his Stock; and I would have no one who has any Quantity of Water at all for them, utterly neglect them.

There are three or four distinct Breeds of Geese in different Parts of the Kingdom, though they are not so much regarded as the same Kind of Differences among other Fowls. We have also some others of Curiosity, but they are not worth the industrious Husbandman's Consideration.

The large grey Goose that is bred in the Fen Countries is preferable to any other Kind, both for Flesh and Feather, and it grows to the biggest Size of any. We have beside this a smaller grey Goose, and a small dark colour'd. Neither of these are nearly so advantageous as the grey; and among the large Kind that are so called, those are much better which are all of a Colour, than such as are pyed or mottled.

This is to be observed, that some of these Breeds are more under a Necessity of Water than the others. The small bodied dark colour'd Goose, of which Kind there are some almost black, will do where there is ever so little, but they are the least profitable Kind of any. The large grey Goose requires most to have Plenty of Water, nor does it any where succeed so well as where there are running Streams: the lesser grey, which is often pyed, will do with less than this, though it will not thrive unless there be some Plenty.

In the Application of these Distinctions to Use, the Farmer must observe, that if he will have many Geese where there is not Abundance of Water, he should chuse the small grey Kind; but when he has Water enough, let him al-

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ways take Care to breed the first mention'd Sort, which is much the best.

Beside Water, a great Advantage for the breeding of Geese, is a good Quantity of Common: they will on these Places provide for themselves in a Manner, without the Regard or Trouble of the Owner; and it is on the common Fen Lands in LINCOLNSHIRE, and the adjacent Counties; that they keep those vast Flocks or Drove, as they phrase it, of them, for the Sake of their Feathers. They pull these in some Places once, in others twice a Year, and find a ready Market for their Produce. They call this sheering of their Geese.

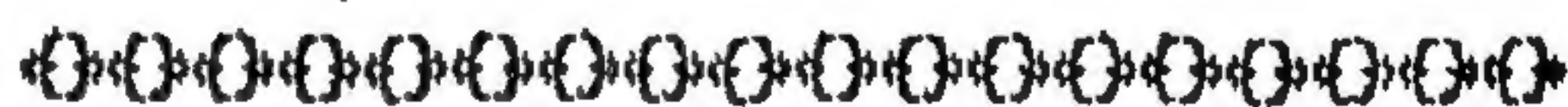
Nothing agrees so well with the Nature of the Goose as Plenty of Room, or a damp Common. They will always breed of themselves once a Year, and in some Places twice, bringing up the Broods with less Trouble or Loss than any other Fowl whatever.

The general and natural Time of the Goose's breeding is in Spring, and the earlier the better for the Owner. For this Reason the Farmer who keeps them about his House, will do well to bestow some Care and Attention upon this Head, although they would raise their Broods if he did not.

Some Geese will not lay above nine or ten Eggs, some will go as far as seventeen: they rarely exceed that Number; and if ever they do, the best Method is to take some away before they sit. A Goose will very well cover fifteen, seventeen is the utmost she can; and there commonly is better Husbandry in setting her on fifteen; for when there are too many, they only cool one another.

There are two Reasons why that Goose is best which lays earliest; the one is, that she will sit earliest, and the green Geese will be ready in the dearest Season; the other is, that she has the best Chance for a second Brood that Year. But there are Disadvantages as well as Conveniencies in this, for the Eggs that are laid in a very cold Season rarely turn out to so good Account as those somewhat later.

There is an Opinion, that if the Gander treads the Goose on Land, the Eggs do not answer so well as when the Copulation is on the Water, and from this they attribute the frequent failing of very early Eggs, to the Waters being frozen over when the Goose was trod; but this is idle: the Misfortune is owing only to the Coldness of the Season.



## CHAP. XXXV.

### *Of the breeding and feeding of Geese.*

**W**HEN the Goose is about laying, she is seen to be carrying Straws about continually in her Mouth. This is for the making her Nest; in which the Owner will do well to assist her, especially in the early Broods. Let him find out for her a convenient Place warm and quiet, and let him there make her a Nest of Straw and Nettle Roots, whose Smell she likes; and it also does good to the young.

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In this she will lay, and when he observes she continues upon the Nest some considerable Time after she has laid, it will stand as a Proof that she is about to sit.

The Goose should be suffer'd to sit upon her own Eggs, for she will not do it well if she perceives any Deceit in this, though they be of the same Kind.

The Geese succeed well enough that lay where none knows of it, yet they will be greatly assisted, and the Brood from the same Number of Eggs, will always be larger, if the same Sort of Care be taken of them that is allowed to other Poultry at the Time of their setting.

For this Reason the careful Housewife will see when her Goose rises from the Nest, to set a Quantity of proper Food before her, that she may find it without Trouble; and some large Vessel of Water that she may wash herself. The best Food is Bran scalded, or Oats; when she sets near a Pond or River, she should not be hinder'd from bathing herself, for she will not sit kindly if she be not allow'd to follow Nature; and this bathing of herself at large is much better for her than the washing in any Vessel that can be set; though that is a very needful Expedient where other Water is not near.

While she is off the Nest, the Housewife will do well to turn the Eggs, if she have not done it of herself: and when some hatch before the others any considerable Time, as they sometimes will a Day or two, she should keep them in Wool, in a warm Place, till the others are hatch'd, and then give them to her with their Fellows.

The Time of a Goose's sitting is from six and twenty to thirty Days according to the Season. They generally sit a Day or two longer in colder than in warm Weather, and sometimes the Difference amounts to three or four.

The best Way of breeding up the Goslings from the Egg is this. Let them be kept within Doors ten Days; in which Time they are to be fed with Barley Meal in Milk, or with Ground Malt, or Curds, or Bran scalded with Milk. After this they should be suffer'd to go out in the middle of the Day, and at about a Fortnight old, the Goose should be suffer'd to intice them to the Water.

They are thus to be tended and fed occasionally, till they have got Strength enough to defend themselves against Vermin, and are able to provide for themselves after the Example of their Parents. For several Days after their first going out, they should be brought into the House at Night, and should have somebody to watch them, for they are poor defenceless Creatures, and a Prey to every Thing; but when they are so far grown up as to feed well, and walk stoutly, they may be left without Danger to shift for themselves. With less Care than this Broods of Geese will often succeed very tolerably; but this is no great Matter, and it in a Manner ensures their Safety.

There are two different Periods at which the Goose is fatten'd for the Market: First, when it is very young; and, secondly, when it is grown. It is distinguish'd at these Times by

two different Names; at the one, it is called the green Goose; and at the other, a stubble Goose. For the preparing it in the most advantageous Manner for either of these, it is to be fatten'd by a proper Manner of feeding.

The right Age for taking up the Gosling in order to fatten it for a green Goose, is at five Weeks; some take it up at a Month, and others at six Weeks old for this Purpose, and either Way does very well; but, for a general Rule, the middle Time between those two is best. The proper Food for them is ground Malt; or Oats boil'd, given in good Plenty three Times a Day with Milk, or Milk and Water for the Drink. If they be shut up in a quiet dark Place they thrive the faster; and by this Means they may be brought into excellent Condition in a Fortnight or three Weeks.

For the fattening of the stubble Goose, the same Method and the same Food are to be used, and in a Fortnight or three Weeks keeping, it will be ready for the Market. The taking them up soon after the Harvest Season, is a very favourable Time for this, because in running in the stubble Fields, they will have got into tolerable Flesh of themselves; and then being kept quiet, and in the dark, and well fed with the nourishing Drink of Milk and Water, they soon fatten up to Perfection. It is a very good Custom to put a little Barley Meal into their Milk and Water, and to let this stand constantly before them, which will increase the Power of the Food in getting them into the due Flesh.

The natural Food of the Goose is principally Grass. They will live very well upon this in Commons and waste Places, where there grows little or nothing else; and thus they are to be kept during the greatest Part of their Time. The stubble Fields are a great Advantage to such as are to be fattened: for that Food which they pick up there from the Scatterings of the Harvest is richer and more nourishing, and tends more to the Nature of that with which they are to be fed when put up for that Purpose. The proper Goose for feeding up in this Manner, is one hatch'd the foregoing Spring, that has run among the Stubble for about three Weeks: this never fails of taking to feed kindly, and grows fat soon.

The Proportion of the Sexes in this Kind is properly one Male to five Females. To a Flock of forty Geese, which is a very good Number for that Purpose, there are to be eight Ganders: more will be superfluous, and with a smaller Number they will not breed to their full Advantage.

If while a Goose is in fattening it nauseates its Food, and does not thrive as it should, let there be set before it a Dish of small and clean Gravel. It will peck up this at Times, and by that Means recover its Appetite.

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## C H A P. XXXVI.

### Of Ducks.

**T**HE Duck is another of those Fowls which Nature has design'd partly for the Land, and partly for the Water, but it is more of the

Water



Water Kind than the Goose. It not only has Feet form'd for Swimming, but the Legs are so placed that it walks very indifferently, wadling as it goes, and is naturally more in the Water than on Land.

The Husbandman who is sensible that the more he observes the Course and Design of Nature, the better he will succeed in all Things; will perceive from this that whether he shall keep Ducks, or in what Number he shall keep them, are Questions in which he must be determin'd altogether from the Circumstances of his Farm.

As the Duck will be content with Puddles, he will find that he may keep some of them wherever there is the least Water; that is to say, he may keep some Ducks every where, for he can keep no Creature without it: but where there is Plenty of Water, and roving Room upon it, 'tis there the Ducks thrive, and especially where it is a running Water.

The Farmer therefore who is situated near a River, is best qualified to breed Ducks to Advantage; and although they do not come up to the Hen, Turkey, or Goose in Value, they have yet enough to make it very well worth his while to breed them. He is not to count the absolute Price of any Thing alone, in order to understand his Profits upon it; but its Price compared with the Expence and Trouble attending it; and thus he will find the Duck of a very fair Value: for as much as its Price is less than that of the others, so much less is the Care or Expence needful about it: the Duck is indeed so hardy a Bird, that it may be left in a Manner to itself; and its young so early take to the Water, that they are out of the Way of Enemies.

The only Time in which the Duck requires any Care, is while she is setting, because then being kept from going in Search of her Food, she will need to have some set before her: but at this Time the coarsest and most ordinary Kinds will do; at other Seasons she will live very well upon the scatter'd Corn about the Yard, the Offal of the House and Kitchen, and what the Current of a running Water is continually bringing down to her. The Duck is a very general and coarse Feeder, scarce any Thing comes amiss to her; yet her Flesh is delicate: among her good Qualities may be reckon'd this, that she is less mischievous than any other Fowl; and she lays Abundance of Eggs which are as good as those of the Hen, and hatches very numerous Broods, which are fit for the Market in the same Manner as the Goose at two Ages, when young, and when grown up: and in either Case they are very easily fatten'd.

There are several Kinds of Ducks kept in ENGLAND, but the greater Part of them for Curiosity, so that the industrious Husbandman needs not give himself any Trouble about them: the two Kinds he is to regard are the common tame Duck, and the wild Duck kept tame, for this Breed will become so familiar from Custom of seeing People, and being among others, that they are as manageable as the other.

Of the tame Ducks there are several Breeds, which, though they differ but in slight Particulars, are yet worth the Farmer's Notice as distinct from one another, because of their different

Qualities or Ways of living. In general the wild Breed require more Water, and the tame will do much better than they to be kept in the Yard almost entirely, as must be the Case at many Farmers. Among the tame there are these Differences, there is a narrow beak'd Breed, which is hardier than the common Kind, and will do with yet less Water; and there is a Breed that have the Beak more turning up at the End: these are found upon Experience to be the better Layers. They do not bring up their numerous Broods so well as some of the others, but when Eggs are the principal Consideration, they are to be prefer'd.

The common tame Duck does the best in Gardens and Orchards, for there is none of them that is so cunning in picking up the Worms, Snails, or other Insects, or that devours them in such Quantity.

It is a very great Quantity of Eggs that may be had in the Season from the Kind just mention'd; and she will in the End sit very well, tho' the others better. In general it is found more profitable to set a Hen upon the Duck Eggs, than any Kind of Duck whatever, because the old one leads them when hatch'd, too soon to the Water; where, if the Weather be chill, some will be lost. They follow the Hen a good while upon the Land, and so get hardy before they venture.

About thirteen Eggs is the proper Number to let a Duck sit upon. The Hen will cover as many of these as of her own, and will bring them up as well, so that every Way she is more profitable for that Purpose.

When the Ducklings are hatch'd, they require no Care if the Weather be tolerably good; but if they happen to be produced in a very rainy Season, it is right to take them under Cover a little, especially in the Nights; for, though the Duck naturally loves Water, it requires the Assistance of its Feathers, and till they are grown, is easily hurt by the Wet.

The fattening of Ducks at any Age is very easy, and whether it be the Duckling, or the grown Duck, the Method to be used is exactly the same. They are to be put into a quiet dark Place, and kept in a Pen where they are to have Plenty of Corn and Water; any Kind of Corn will do, and with this single Direction, they will fatten of themselves extremely well in fifteen or twenty Days; and will bring a Price that very well repays their feeding.

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## CHAP. XXXVII.

### *Of the keeping of wild Water Fowl; and of Decoys.*

THERE are several Water Fowl resembling the Duck Kind, which People of Curiosity keep in some Places; and for which there is so good a Price paid in the Market when they are by any Chance brought thither, that it may be worth the Husbandman's while, where Nature has assisted in suiting his Situation to such an Intent, to follow the Method that has been taken by those who had no farther View



View, than to satisfy their Fancy or their own Palates in the keeping of them.

As these are naturally wild Fowls, they are expected to be kept wild, in a Manner, though under the Care of the Farmer; and they must be humour'd in this Way; they must have a Place of Security; and Opportunities of hiding; they must not be disturbed by Peoples often going near them; and they must be fed as it were by Stealth.

The great Intent in all this is, to make themselves fancy they are wild, though in Confinement. In this Manner Teal, Widgeons, and many other of those Water Fowl which bear a Price in the Markets, and which few think could be bred to the Service of the Farmer, may, where he has the proper and needful Conveniences, be rais'd in a Kind of wild State, and in considerable Plenty.

The first Requisite to this is, that there be about the Farm a Spring of Water, upon some level Ground, that wets a moderate Extent, and lies to some Depth in different Places: this answers excellently; and there must be either this, or a Part of the Arm of some River, or Rivulet, that the Farmer has wholly at his Disposal, otherwise it is in vain to attempt any thing in the Matter.

Having one or other of these Places, let him fence it well round; plant Oziers in different Parts, and encourage the Growth of Sedge and all Sorts of Weeds in others. The great Advantage will be, to give the Fowl that are to be put into it, as many hiding Places as possible. The Top is to be cover'd with a Net. And when all is thus prepar'd the wild Fowl are to be put in; and being kept very quiet, they will breed and live comfortably. The Hens of the several Kinds will hide their Nests from the Males, for they never fail to suck the Eggs when they can get at them: and thus considerable Broods will be rais'd.

These will provide for themselves in a great Measure: and the Food that is to be given them may be Corn of the least valuable Kind: this should be thrown down in two or three different Places at Night, when they are at roost, that they may find it in the Morning. This will accustom them to come to certain Places, and will give the Owner better Opportunities of knowing what is his Stock, and of taking them when he finds it convenient.

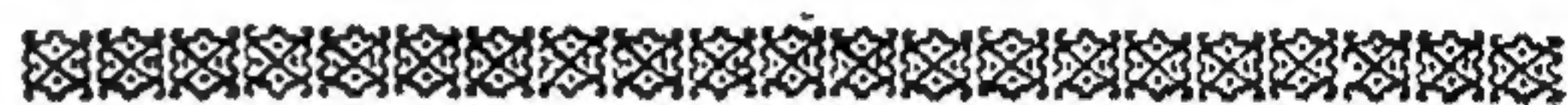
At the Times when there are young there should be scalded Corn thrown in, which the old ones will lead the Brood to eat: there is no kind of Creature more careful of the young, than these Water Fowl, nor are any Birds whatsoever so well or so soon able to shift for themselves.

This is the Contrivance for the breeding these Water Fowl in small Numbers, and somewhat of kin to this is that Method practised in the Fen Countries, of taking them in Decoys; which yields the Owner a prodigious Advantage.

The Decoy is no other than such a watery Place as we have described already well planted; of large Extent, and properly managed for the taking of such wild Fowl as come into it. Nature generally has made the Place, and all that

the Owner has to do is to keep every thing quiet about it. This has no Covering at Top, nor Fencing at the Sides; its Extent is sufficient to keep its thickest Parts free from Annoyance, and all is to be open for the Fowls coming in. There are Nets planted in proper Parts of the Decoy, and a Number of Decoy-Ducks, as they are called, continually well fed in it. These, though of the wild Breed, are in a Manner tame; they know the People and are not afraid of them; for they find they are well fed by them, and suffer no Hurt.

These Decoy-Ducks go out at Times, and settling among whole Flocks of wild Ducks, they, after a little while, lead them to the Decoy, and swim before them into the Nets: they know they shall not be hurt. The People take the wild Ducks they have brought, for Market; and turn them loose for farther Service.



## C H A P. XXXVIII.

### *Of the Swan.*

THE Swan is a less profitable Fowl than the meanest of those before mentioned: and therefore, notwithstanding the Majesty of its Figure, and Beauty of its Appearance, is less worth the Farmer's Regard than any. It is kept indeed rather for Ostentation than Use, and more properly belongs to the Owners of Waters than the Renters of Land. However, as it is a common Bird kept tame, and approaches to the Nature of the others, it might appear an Omission not to have given some short Account of it among the rest of its Kin: the more, as we propose to instruct the Gentleman with the Farmer; and though our Purpose be to his Advantage, yet we need not deny a few Words on such Things as are kept, in a Manner, solely for Delight. This, notwithstanding those several Dishes that we hear of, as made from the Swan, is the principal Use for which that stately Bird is kept.

The Swan has been design'd by Nature, in a Manner, altogether for the Water, for it walks very awkwardly on Land: but on the Water it has great Strength, insomuch that at Times when the Hen sits, the Male who guards the Nest with great Diligence, is often very furious; and at any time will defend himself against a middling Dog; and will often drown him.

Swans require a large Compass of Water, and do best upon Rivers: where there is this Opportunity the Owner will be in the right to breed them, for they are kept without Charge, and are a great Ornament to the Rivers. Neither are they so hurtful as those imagine who have been told they destroy the Fish, for their natural Food is Grass, and the fresh Water Weeds, that run at some little Depth under the Stream.

They require no more Attendance than they do feeding, but being once put on the Water will, in all Respects, take Care of themselves.

Those who are very tender of their Swans will give them a little Attendance while they sit, and they



they will do the better for it, though this is not altogether necessary.

They must chuse the Place for their Nest themselves, which is so large that it is very easily seen; and if the Owner would assist them, he is first to do it by planting Boughs about the Place, if not naturally shaded, in order to keep off the Heat of the Sun; and after this, when the she sets, he is to set some Oats in a Trough near the Nest, that she may not be induced to leave the Eggs too long in search of Food.

The Swan lays from six or seven to twelve Eggs, rarely more; and her common Brood is four or five, though sometimes more. If the Eggs hatch nearly together the Brood is the larger, if not, when there are four or five young ones hatch'd, she sets off with them; and takes no farther Notice of the Remainder. To prevent this Accident the young ones may be taken from her as they are hatch'd; and then she will continue sitting to the last. These first hatch'd young may be preserved in Wool, and all committed to her Care at last.

The Time of the Swan's setting is from six to seven Weeks, and often there will be some of the young hatch'd three Days before the others. These, if taken from the Parent, may have some scalded Oats and Milk set before them the second Day, and they will feed readily.

When the Brood are hatch'd they follow the Dam in the Water, and sometimes get upon her Back; and she is so excellent a Guardian and Provider for them, that she very rarely loses any of the Number.

Those who are fond of uncommon Sorts of Food will fatten Cygnets, or young Swans, for the Table. When this is intended, the Cautions already laid down, for keeping the Swan upon her Eggs till they are all hatch'd, should be carefully observed, that there may be a Supply, and at the same time a sufficient Brood of young to grow up.

If the young Cygnet be taken out of the Water and dress'd, there is not so ill-tasted a Fowl in the World, for its Food being River Weeds, gives the Flesh a very rank and disagreeable Taste; but when they are fatted for eating, they not only get a great deal more and tenderer Flesh, but it is of a better Flavour. They are, in this Case, much like the fed green Goose, only much larger in Bulk, and coarser in Appearance; and their Taste a great deal stronger.

The Method of fattening them is this. They are to be taken from the Parent at five Weeks old, and put in Pens in a quiet darkened Place: they are here to be fed to their full Appetite with Oats, and to have Milk and Water for drink. They will fatten up in a Month, and be fit for the Table.

This is the Method of managing them for such as think it worth their while to be at that Trouble, but they are not worth it for any; and as they do not bring a Price at Market, the Husbandman has nothing to do with the Thoughts of them.

## C H A P. XXXIX.

### *Of the Peacock.*

THE Peacock is a Bird kept like the Swan, more for its Beauty than any Use; and consequently it falls rather under the Consideration of those who raise Fowls for their Amusement, than such as are industrious on these Heads for their Advantage: there are those who make this Fowl turn to some Account for the Table, but 'tis a Dainty, not a common marketable Provision; and nothing is, on this Occasion, worth the Farmer's Regard, that he cannot regularly take to Sale.

The Peacock is therefore to be looked upon as a Bird of Fancy, not of Use, by the Farmer, and 'tis hardly worth his while to give it Leave to take up the Room of some Fowl that might answer his Purpose: for the Sake however of those who shall chuse to raise them for their Beauty, we shall lay down a few short Observations on their Nature and Qualities.

The Peacock is at Land what the Swan is upon the Water, the stateliest and most beautiful of the feather'd Kind. It is very tender while young, but afterwards hardy enough; and as it requires little Care, and finds itself in Food, it may sometimes be worth the Farmer's while who lives near a large Town, or where there may be a Demand for the Chick, by those who keep them for their Beauty, to allow one Peacock and Peahen to run among his Poultry.

The Peacock is not only kept without Expence, but he is useful to the Owner in his feeding. He not only provides for himself, but rids the Ground of Vermine, in that Article, for his Food is Efts, Toads, and Snakes. He will eat Corn when he can get it, but this is his common Diet.

The Peahen will make her Nest in Thickets and Bushes; and she takes all possible Care to hide it from the Cock, for he in this, as in many other Kinds, will destroy the Eggs if he can find them.

When the Peahen has set herself, it will be proper to put some Corn and some Water near her, that she may not be under a Necessity of leaving her Eggs to chill, while she is seeking at a Distance for Food.

The Time of her sitting is thirty Days, and as the Chicks are very tender when first hatch'd, they must be housed for some Days, the Cold soon killing them. During this Time they are to be fed with fresh Cheese, or with Barley Meal and Water. They must be let out in the Middle of the Day, and taken in again at Night, for several Days, and when they have, by this feeding and Management, got some Strength and Bigness, they are to be trusted out with the Dam, and then no farther Care need be taken of them. The Cock seems not to own them till the Feathers that form the Coronet upon their Heads begin to rise; but after this he is as fond of them as the Hen, and will call them about him to feed, providing for and defending them with great Care.

From the Time of their going at large with the Hen, they need no more Care of feeding or  
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Attendance, except any one has a Mind to fatten them for the Table. If this be done, the usual Time is when they have arrived at about half their Growth, and they are then put in a Pen, in a dark quiet Place, and fed with any Kind of Corn as much as they will eat, and have Plenty of fresh Water. Quiet, and Plenty of Food will thus make them fat in about a Month's Time, and their Flesh will be better tasted than when they run at large, and take their natural and coarse Meat; but at best they are inferior to almost any Kind of Fowl, and have a very strange, raw, and bloody Appearance, when they have been set by for a Night after Dressing.

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#### C H A P. XL.

##### *Of the Pheasant.*

**T**HE Pheasant, though naturally a wild Bird of the Woods, is much of the common Poultry Kind, and may be bred in the same Manner in proper Places erected and contrived for that Purpose: but as this is an Article in the Way of the Gentleman rather than the Farmer, we shall not detain our industrious Reader with any long Discourse on the Subject.

There are Pheasantries in many Parts of ENGLAND, where Numbers are annually bred, and grow up; but there requires a great deal of Care about them when young; and a Regard to their Danger from Kites, Hawks, and other Birds of Prey at all Times; for the Pheasant is of all Fowls the delicate and favourite Bit with these Devourers.

The roosting Places are to be well defended for this Reason, and the Fence is to be high to prevent their Escape. They lay freely, and bring out large Broods, but several die in spite of all possible Care in the raising; however, with good Diligence, a Number of them may be rear'd.

The natural Food of the young Pheasant is that white Substance called the Ants Egg. The old ones in their wild State lead them to the Ant Hills in the Woods for this, and they must be supply'd with it in Abundance by the Industry of the Keeper, when bred tame, otherwise they droop and come to nothing; this occasions a great deal of Trouble at first with them, but after that they will be train'd up with great Ease, for they will eat any Kind of Corn, and they are not tender or difficult to raise.

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#### C H A P. XLI.

##### *Of Pigeons.*

**W**E come now to treat of a Fowl smaller in its Size than any of the before mention'd Kinds, but superior to many of them in Value; the Pigeon. The Management of this Bird is also different in a great Measure from that of the others, so that it naturally falls under Consideration singly. But there is no one of all those Kinds about which so much Care is generally taken, that is more worthy of the Notice and Attention of the prudent Husbandman.

It is a great Recommendation of any Creature to the Farmer, that it will be kept at small

Expence, and this is the Case with the Pigeon, which he should keep; for there are some Kinds that require a great deal of Food and Charge: the proper Pigeon for the Dovecoat, which is the only Kind he is to regard, is able the greatest Part of the Year to provide for itself; and when it requires his Assistance, the Food is not of any dear Kind. Beside the common Advantages of the Breed, there is that great Article their Dung, which we have treated of in its Place; and which we have shewn to be of such great Service as Manure, that it must be the Interest of every Farmer to provide it for his own Use, especially as that is to be done with great Ease, and the same Method that affords it will yield him also a great many other Advantages.

There are at this Time many Kinds of Pigeons kept in ENGLAND, by People fond of Curiosity, and it has become a Study to procure and raise new Kinds among those who are called Pigeon-fanciers, as much as to get from Abroad, or raise from Seed, new Kinds of Carnations or Auricula's among the Florists. But with this the industrious Husbandman has nothing to do. He is to keep Pigeons for their Value, not their Beauty; and he is to consider which may be kept with most Ease, which is in his Way one of the greatest of Recommendations to any Thing.

Not to enter into the nice Distinctions of the Kinds which are of late Years become endless and innumerable, we may say in general that there are two Sorts; the tame, and dovecoat Pigeon. The tame Pigeon is valued not only for his Beauty, but for the Largeness of its Body; the common Pigeon, which is the Kind usually kept in Dovecoats, and thence called the dovecoat Pigeon, is smaller, and less beautiful.

The tame Kind generally have but two young ones at a Brood; but they make some Amends for the Smallness of the Number by the frequency of their hatching; for, if well fed and tended, they will have young ones every Month.

For the Choice of these the Beauty is generally most regarded; but there should be Care taken to pair them well, and this is the more worth while because they are not apt to separate afterwards.

They must be kept clean, for they hate Dirt, though they make a great deal of it. But their Food is so dear, that few but those who know very well how to manage them care to meddle with them. Their best Food is Tares or white Pease, and they should have beside this some Gravel scatter'd about, and clean Water at all Times: and a great deal of Care must be taken to preserve them from Vermin, and their Eggs from the Starlings and other Birds, which always haunt the Places where they are kept, in order to suck them.

In order to the perfect Thriving of these Pigeons, it will be proper, beside their Food, Gravel, and Water, always to let there be some Salt, Clay, or some other Thing with Sea Salt in it, for them to peck at their Pleasure.

We have said thus much with respect to the Management of the tame Pigeon, for the Information of such as may chuse to breed them, and have not had Opportunities of seeing it done; and it will



will be proper to add here, that although the Expence and Trouble they occasion, be more than is worth the Husbandman's while in general to give himself; yet there is this Advantage, that their Dung is richer than that of the common Pigeon as a Manure: this is owing to their Food, as has been explain'd at large in its proper Place.

After this short Account of the tame, we come to the Consideration and Management of the common or dovecoat Pigeon; which is a Subject that demands, and deserves the Husbandman's utmost Regard.

The keeping of Pigeons is a great Advantage to every Farmer that may do it; and they bring in a great Profit for a very small Expence in all Places; but they thrive best in open Countries, because there is usually most Corn there, and they feed with less Danger, the Hedges in enclosed Places sheltering People while they shoot them.

There are some Counties where the Husbandmen sow great Quantities of Horse Beans and grey Pease, and in these particularly the Pigeons feed to a great Advantage. These Sorts of Pulse are sow'd earlier than other Kinds of Grain; and their early feeding upon them makes them healthful and stout at those Times, and is an Occasion of their breeding earlier than they do elsewhere, which is a Consideration of great Importance.

The common blue Pigeon is properly the dovecoat Breed; and it has the Advantage of many other Kinds in that it is hardier, and will live in the worst Winters.

If it be too small for the Farmer's Purpose, he may mend the Breed by putting in a few tame Pigeons of the most common Kind, and the least conspicuous in their Colours, that the rest may the better take to them by finding them more like themselves; this, however, is to be done with Caution, and never without a due Consideration; for though the Bigness of a Pigeon's Body is a plain Advantage, yet it is very well known in the Kinds in general, that the smallest body'd are the best Breeders.

The Ringdove has been by some introduced into the Dovecoat, by setting the Eggs under a common Pigeon; they will in this Case live, and take their Chance among the Pigeons; and they have two Advantages over them, the one in their Largeness, and the other in their Hardiness; for they will endure any Weather, and live upon any Food.

The Husbandman should have a very careful Eye upon the Proportion of the Sexes among his Pigeons; for there is nothing so hurtful as the having too many Cocks, especially if they keep the larger or tame Kind. It is his Business to keep his Dovecoat well stock'd; and most People who keep them make their Consciences easy about deluding away those belonging to their Neighbours; but this Abundance of Cocks thins the Dovecoat, for they grow quarrelsome, and will beat others away; till by Degrees a very thriving Dovecoat shall be by this single Mistake reduced to a poor Condition.

A very cheap and easy Way of making a Dovecoat is to build the Walls with Clay mix'd

with Straw; they may be made four Foot or more in Thickness, and while they are wet it is easy to cut Holes in them with a Chissel or other Instrument.

This Kind of Dovecoat, beside its Cheapness, has the Advantage of great Warmth; and no Building agrees better with the Pigeons. A Dovecoat of this Kind of four Yards square in the Clear, may be built for about Five Pounds.

The Holes should be made about fourteen Inches deep, and a little dipping backward: The Reverend Mr. LAWRENCE who used this Method of building his Dovecoat, says, That the Pigeons prosper'd in it better than in any Brick or Stone Building he had seen.

Of whatever Materials the Coat be erected, it should be white-wash'd frequently on the Outside. The Pigeon, as has been said already, is a cleanly Bird: it loves the Appearance of Neatness; and beside the white Colour renders the Building more conspicuous.

As to the Food of Pigeons, beside the Pease and Tares already mention'd; Barley is very proper, heartening them very much; and making them lay; and for the same Purpose Buckwheat also is an excellent as well as cheap Food.

For the greatest Part of the Year however, the common Pigeons in a Dovecoat take Care of themselves, and need no Food from their Keeper. There are only two Seasons at which it is necessary or proper to feed them: One of these Times is the Depth of Winter, when the Ground is cover'd with Snow, or harden'd so by Frost, that nothing is to be got; and the other is, the middle or latter End of JUNE.

The Reason of feeding them in the first of these Seasons is obvious; the latter, the Farmers when they speak of this Fowl call benting Time. There is a Grass called bent Grass, the Seed of which is ripe about this Season, and is the only Food of that Kind the Pigeons can easily get, the Pease being not yet ripe. This is a very poor Food, and the Pigeons at this Season usually have many young Broods; so that they will be starv'd if they are left to this poor Diet; and the Farmer will always find his Account in giving them Food at this Season, as well as at the other. This lasts however but a small Time; and the other is only necessary at the severest Days of Winter; so that the Pigeon is at the utmost but a small Expence; and that for a very short Time.

Beside the Food, the Breeder of tame Pigeons has been advised to give them a Lump of salted Clay, and the same Indulgence must be shewn to these. But as they are more numerous, there is to be a larger Allowance: A large Heap of Clay should be laid near the Dovecoat; and the Brine of the Family continually beaten in among it. Another Way is to make a Kind of Mortar with Lime, Sand, Clay and Salt, which they will peck with great Satisfaction. The Pigeons themselves have pointed out this Method, for they are continually pecking at the Joints of Walls to get out the Mortar. When it is thus made on Purpose for them, it is best to make it thin, and keep it so by often beating it up with Brine.

In some Places they lay what is called a Salt Cat;



Cat, near the Dovecoat. This is a large Lump of Salt made for the Purpose at the Salt Pans; and is the Method commonly taken where there are Works in the Neighbourhood, but the Way of using Salt in a Mixture with Clay is better.

What I have found by Experience to answer best of all is this. A Heap of Loam is to be laid near the Dovecoat, and beat up to a Kind of Pap with Brine or Water; into this is to be thrown a large Quantity of Bay Salt, and a little Saltpetre, and with it a Shovel full or two of large coarse Sand. When Brine is used to beat up the Loam, less Salt is to be used; and when Water, there must be the more of it in Proportion. And in the same Manner if the Loam contain a great deal of Sand, the less is to be added to it; and if it contain less, the more is to be given. Where Loam is not to be had Clay will do, but then a much larger Quantity of Sand must be put in; and the best Sand for this Purpose is large coarse Sea Sand, which is already impregnated with Salt Water; or that which is got in screening of Gravel.

It is a very singular Thing that the Pigeon loves Salt in this Manner; and its Fondness for Saltpetre, which is very great, is not so well known; though this might have been discovered by observing the liking this Bird has to the Mortar in old Walls, which contains a Salt very nearly ally'd to the common Saltpetre.

Salt is not only useful in this Manner to please the Pigeons, when they are in Health, but nothing recovers them so readily from Sickness. A Mixture of Bay Salt and Cummin Seed being with them an universal Remedy.

A great many Contrivances have been publish'd; and many more are handed about among the Country People as great Secrets, for the making the Pigeons love their Habitation, and tempting such Stragglers from their Neighbours as chance to come to the Coat to settle in it. Some have advised the Use of Assafœtida, and others of Cummin Seed before mention'd for this Purpose; but the best Method of all others is to keep up constantly such a Heap of salted Loam as I have before describ'd; this is what they love, and they will therefore stay where they can have it in Plenty. This Contrivance, with the Addition of keeping the Dovecoat neat and clean, and not suffering them to be disturb-

ed in it, will be sure to keep the Stock in good Number, and too likely to increase it at the Expence of the Neighbours.

The Profit of Pigeons is very considerable, and very certain; for they breed fast, and there is a constant Demand for them. Near great Towns it may be worth while to keep some of the large tame Kind; because, although they cannot be fed but at a large Expence, yet their young come so early, and are so fat and fine, that they command a Price, which very well returns it: but in the Country the common Pigeon is the proper Kind; for though the Price that the Birds fetch is not nearly so great, their Number, and small Expence of keeping, very well make Amends.

Among the Methods which are recommended for the drawing Pigeons to a deserted Dovecoat, one of the most ridiculous is that of a baked Bitch. This is perform'd with great Ceremony: the Creature is to be killed at the Time she is proud, or salt, and then flead, baked, and laid in the Dovecoat. Some improve upon the Practice. by putting Cummin Seed in the Belly: for the Pigeon is really fond of the odd Smell of this Seed, which is the most disagreeable of all those called Aromatick. This may therefore have some Effect; the other can have none; and yet the wonderful Powers of it have been recorded by many Authors. The plain Account of this is, that a Dovecoat has been deserted because of its Dirt and Nastyness; and they have cleaned it out, and laid the baked Bitch in it: The Effect of the Cleaning they have laid to the Carcass of the Animal: for it is not the Countryman alone who mistakes Causes.

I have spoke often to the Farmers to recommend their setting up of Dovecoats, but have found it in nothing so difficult to make them listen to me. While they have bought Pigeons Dung at a great Price, and fetch'd it from a great Distance, they have still been backward to think of keeping Pigeons themselves for their own Supply. There is a Superstition among them, that it is unlucky to set up a new Dovecoat; this has come down from Father to Son, and they persuade themselves it would certainly be follow'd by Death in the Family. Nothing can be so ridiculous, or so weak, as such a Supposition; but there never was an old Woman's Tale so deeply rooted.

## BOOK V. PART III.

### Of F I S H.

#### C H A P. XLII.

##### *Of the Advantages of Fish Ponds.*

**F**ISH are not consider'd so much as they ought, either by the Husbandman himself, or by others, as a Part of his Stock; but we shall endeavour to shew from Experience, that it is as easy for him to manage these as any other

of the already mention'd Creatures, and that the Profits arising from them are very well worth his Attention.

We are here treating of those Animals which he may keep upon his Farm, or in his Grounds, and Fish are very plainly of that Number. He must have some Water, and he may, according to the Situation of his Farm, have a great deal.

Fish



Fish will live in this, and he may have a reasonable Profit in all Cases, and in many a very large one.

One Kind of Fish will live in one Sort of Water, and another Kind in another. There is some Species that will live in all; and he who has Water, and leaves it unoccupied by them, defrauds himself of a Part of his natural Advantages, as much as if he were to omit to put Stock into his Pastures.

But there is a farther Consideration yet in the Reach of the prudent and industrious Husbandman. Wheresoever there is Water we see Fish will live: it is not only his Interest at all Times to put a Stock of them into Ponds, when he has them; but it may be very often worth his while to make them for this Purpose.

I have labour'd throughout this Work to put the Farmer in a Way of making the most Advantage from every Part of his Land; and have propos'd in the Plan of it to consider in what Instances Art may, for his Service, come in to the Assistance of Nature; and in particular, how Pits may be converted into Fish Ponds.

I shall here enter into that Consideration a little farther, and endeavour to shew, not only how he may stock whatever Water he has with Fish that is fit for that Purpose; and how render that in some Cases proper for their Reception, which was before from some Circumstance or Accident unfit for that Use; but in what Case it may be to his Advantage how to dig Ponds purposely for this Use.

There may be Parts of his Ground, which from their Nature and Situation will yield him little Advantage any Way else, and which may be converted to this Use with considerable Benefit. In this Case I shall advise him to put them to that Use, though at some Expence; and shall lay down the most advantageous Method of doing it. The Lands on which it may be proper and advantageous for the Husbandman to make Fish Ponds, are of two Kinds; those which are boggy, or naturally watery; and those which although dry and firm, lie in the Bottoms between rising Grounds. These are to be selected for two different Reasons; those of the first Kind because they are either fit for little else, or can no Way be made so useful; and those of the second, because they will answer a double Purpose, the watering of Cattle, and the breeding of Fish. These will be supplied by the Waters from the rising Grounds, and will in this Use bring a great Profit, as well as great Convenience.

We are to remember in this Place, that we write to the Gentleman as well as to the Farmer: in that Light we may name the Supply of the Table from these Ponds as a very great Article; for all that is saved in Expence is got: and the Addition of good Fish in Plenty is a Consideration of great Value to the Table of a Person of Fortune. The Farmer is only to consider the Demand at Market; but this is abundantly enough to answer his Purpose. He will hardly deny himself the Produce of his Waters at his own Table; but 'tis not in that Case to be regarded as an Article of Profit, for Fish are not the Food for a Family.

N<sup>o</sup> 21.

When the Ground is fixed upon for the making a Fish Pond, let the Undertaker consider, whether it have Springs to feed it, or must depend altogether on the Rains: for this makes a very different Management necessary. Ponds that have Springs will be safe from drying on an entire Flat: but there should be a Descent to those which are to support themselves by Rains, for without this they will fail at Times; and the drying up of a Fish Pond is a terrible Stroke upon the Owner.

When Flags and Rushes grow on a low Piece of Ground, 'tis a Proof there is Water near. We have shewn already of how little Value the natural Products of such Lands are, and have laid down the Methods of improving them by Culture: let the Husbandman consider the Expence and Profits either Way, together with his own Occasions for Water, and the Extent of the Ground; and then determine what Course to take to render it the most useful, and obtain from it the largest Profit.

On the other hand, in those Grounds which lie between Hills, Ponds will have the Advantage of what is wash'd from the rising Grounds by the Rains. They will feed Fish, water Cattle; and also afford from their Bottoms a Manure of the greatest Consequence to the Farmer.

The Water that runs in wet Seasons from the Hills, does not go off pure Rain: it washes away with it the lightest and richest Parts of the Soil, and also the finest Part of the Manures and Dressings the Husbandman had laid on his Grounds. This enriches the Water, and feeds and supports the Fish in a surprizing Manner; and after all it is not lost. The having Ponds in these Places is the true Way of saving it. All runs into them with the Water, and settles to their Bottom after a Time; and is finally left there. This is the Occasion that Ponds situated so as to receive the Water from high Lands fill up so soon, but that is no Disadvantage to the Owner; on the contrary, it is a lasting Source of Manure, and a great Benefit. These Ponds are easily cleaned, and this Mud many Times over pays the Expence of the Work. In this Case it is proper that Provision should be made for receiving the Fish during the cleaning of the Pond: the Person who thus foresees the several Advantages of what he is about to undertake, will set about it with the more Spirit, and will contrive accordingly.

The Necessity of cleaning Ponds is absolute, but so also is the Advantage attending it. The Time is very different according to their Situation. Ponds in an even Ground, that are fed by Springs, need not be scoured above once in fifteen Years; but those which receive these rich Waters from Hills, sometimes require it every four or five Years. And the others in Proportion, according as they partake more of the Nature of one of these or the other.

We have in several of the preceeding Articles of the Farmer's Stock, reminded him of the great Value of those Creatures which are kept at a little Expence; this is no where to be more considered than here; for the first Expence is all. Many Creatures are to be kept at a little

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Charge,



Charge, as they in a great Measure provide for themselves; but Fish entail no Expence upon their Owner at all, for they will do this entirely.

We shall hereafter observe, that it may be sometimes worth while to throw into a Pond where Fish are feeding, some Things of very little Price, but even this is not necessary. The Fish of Prey are to be supplied by first stocking the Ponds with Roach, and the like Fish, which are of so little worth, that they are fit for nothing else; and are so numerous, that they may be often drawn up in a Net by Bushels: for the rest, Grains, or Refuse of the like Kind, is all that can be given them.

Having shewn these Advantages of Fish Ponds properly situated, we shall in the next Chapter proceed to lay down the Methods of making them most advantageously, and with least Expence.

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C H A P. XLIII.

Of the making of Fish Ponds.

WHosoever proposes to make a considerable Advantage from Fish Ponds, must have several of them. He must have some to receive the Fish of those which are cleaning; and he must have some for one Kind, and others for another. He who should put his Fish of Prey and his others together, would find a very sorry Account in the End.

There is a farther Consideration also, which demands that there should be a Number of Ponds; this is that they are intended for different Uses. Some are for breeding, and others for feeding of the Fish. There should be a distinct Pond for the Pearch, and another for the Carp and Tench; but he must have one Pond for his Carp to breed, and another for them to feed in; for Experience shews those who never trouble themselves about the Reasons of Things, that in those Ponds where Carp breed, they feed very poorly; and, on the contrary, in those Ponds where they feed well, they scarce breed at all.

In general, Fish Ponds may be divided into two Kinds, such as have sharp and clear Water, and such as have it soft and thick. The first of these are the Ponds for breeding, but the others are those for feeding.

This may direct the Undertaker in general in his Work, and we shall in their Place add more Observations on this Head: from what has been said of the Number and Variety of his Ponds, and their appropriated Uses, he will the better conceive what is meant in every Particular of those Directions we are about to give for the digging and conducting of them.

The best Method of all where the Ground and other Accidents concur to favour the Intention, is to have a String or Row of Ponds, where there is at the upper End a small feeding Spring for the Supply of the whole, so that in dry Seasons they may be sure to be kept up with a due Quantity of Water; and there should be also Contrivances for letting off the useless or abun-

dant Water from them, that they may not be overflow'd.

At the Head of every Pond there should be a Sluice, and this Head must be made in the lowest Part of the Ground. A great deal depends upon the proper Structure of the Head, and Contrivance of the Sluice. The Head must be very firm and sound, or it may give Way, and destroy the whole Work; and the Sluice should be so made, that the Water may, upon Occasion, be let off very freely and quickly: the great Care that should be taken on this Head is, that there be a sufficient Fall from the Sluice, for on this the Quickness of the Waters running off will depend, more than on any other Consideration whatsoever.

In order to set about making the Head of the Pond, a proper Quantity of strong Stakes are to be provided. They should be of about six Foot long, strait, thick, and of such a Wood as will bear the Dampness of the Soil. For this, Directions have been given already in our fourth Book; where the Reader will find an Account of the several Natures of the Species of Timber, and the Purposes to which they are suited: so that he is to select among the several Kinds that will answer this Purpose, that which he has most at his Command, or can supply himself withal most conveniently.

The Stakes being ready, let him set about his Work by driving them firmly into the Ground in three Rows, at four Foot Distance Row from Row, and about three Foot severally in each Row. These Rows must be carried the whole Length of the Pond Head; and the first Row must be driven four Foot into the Ground.

This is a very sufficient Preparation for the Superstructure, where the Ground is tolerably firm; but in Places where it is loose and sandy, it is a very good Method as soon as the Stakes are rammed, to pour in a good Quantity of Lime. This will flake gradually with the Wet, and mixing with the Sand, will become of itself a Kind of very firm Mortar, binding all about the Stakes in the Manner of a Stone.

When the Soil is not absolutely sandy, and yet is not so firm as might be wish'd, it is a good Way at first to put a Layer of Earth, and a Layer of Lime, and so work up the Foundation.

When the Stakes are thus driven, and the Ground is secured, let the Workmen begin to dig the Pond, whether that be to be done entirely, or Nature only to be assisted in it.

Let the Earth they dig be thrown among the Stakes, and rammed well down, and thus laid in till they have entirely covered the Earth, being raised in a Bank above the Level of their Tops.

Another Parcel of Stakes are now to be driven in the same Manner as the first, and in the Interstices between them; and the Earth that is dug is to be again laid in among these; and so, if needful, a third Parcel are to be driven, and filled up in the same Manner with the Earth that is dug. The Nature of the Situation is to determine this, and the Expence will be proportion'd to the making of this Head in Height.

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This Head or Bank is not to be rais'd perpendicular, and all of a Thickness throughout; but sloping upwards on each Side, in the Manner of those Banks we have before directed to be made for the securing Lands from the overflowings of the Sea. It is to be thickest at the Bottom, and smaller all the Way up: and the Slant on the Inside must be made very smooth and even.

When it is thus carry'd up to a due Height, and the Sluice fix'd, and there is a Convenience for carrying off the waste Water in Time of Floods, it is finish'd; and the rest of the Work is cheap and easy. The whole String of Ponds are to be fabricated in this Manner, and they will always be managed afterwards with Ease and Convenience. It will also be a great Addition to the Work if a Side Ditch be dug, with Sluices out of each to it, for the emptying them separately. For by this Contrivance any one of the Pond, may be emptied without disturbing the others. This is a Contrivance we find mentioned by Dr. Plot, as practis'd at STANTON HARCOURT, in OXFORDSHIRE; and it is so rational, that it must be well worth while to follow it in other Places.

The Head being made, we are to consider the Construction of the Body of the Pond. As to its Size, that must be proportioned either to the Nature of the Ground, or to the Quantity of Fish intended to be kept in it. But whatsoever be its Bigness, there are some unvariable Rules to be observed in its Construction.

The Depth is a very material Article: for there are great Inconveniences attending the making it too deep or too shallow; and one Reason of the ill Success of Fish Ponds in some Places is, that the Owners have taken them just as they found them, and some are too deep and others too shallow. A Clay Pit, or a Gravel Pit, may be capable of being converted into a Fish Pond; but he would be very idle who should take them for that Purpose just as he finds them, and expect as much Advantage as if they were better form'd.

The proper Depth of a Fish Pond is about six Foot. It may be something deeper without Disadvantage, but no Pond should be contrived to be of a less Depth than this, at middling Fullness.

We have observed already that the Ponds are to be of two Kinds, according to the Nature of their Water, the one for breeding, and the other for feeding of the Fish; and that this depends upon the Quality of the Water; the poorest being fit for breeding, and that which is most enriched by Additions, for feeding.

Therefore, supposing these Ponds to be all supplied by one original Spring rising above the first; running through that, and thence into the others; it is plain that the Water of this Spring will be clearer, sharper, and purer in the first Pond, into which it is received immediately from the Source, than in those others into which it runs through that, and successively through one or more of them also. Therefore in such a string of Ponds, the first or highest will always be fittest for a breeding Pond; and the last or lowest fittest of all for a feeding Pond; and so of the rest pro-

portionally, those will be fittest for breeding which are nearest the first, and those for feeding which are nearest the other, or lowest. This is a very material Distinction, for there should be a Difference in the Construction of the several Ponds, according to the Purposes for which they are intended.

One breeding Pond is enough to supply several for feeding; so that, in general, under such a Distribution of Ponds in a Row, as those here described, the proper Method will be to keep the first, or that which immediately receives the Spring, for breeding, and the several others that come next after it, for the Pike, Perch, and other Fish of Prey; and only the two or three last for feeding; which will receive their Water enrich'd by what it has collected in passing through the several others.

According to this Distribution, the first Pond should be the least deep of all: and should have some Places particularly shallow, and contrived on Purpose for the receiving the Spawn. Its general Depth should be five Foot; just at the Head it may be, for a little Way, five and a half, or six Foot; and the Head itself should be carried down with a gentle Descent into that Depth, and toward the Water's Edge bottom'd with a clean Gravel. The Sides should also, in most Places, go down with a very gradual Descent, and here and there be extended in Shoals, some of which should have Stones and Gravel thrown over the Bottom; and the others left naturally. These shallow Places serve for the Fish to sun themselves upon; and they lay the Spawn upon them, which in those Places receives the Influence of the Sun, and is assisted by it in the hatching into Life.

In general, Ponds that have a clean Water, and a gravelly or sandy Bottom, are the best for breeding; as those which have a soft or muddy Bottom are for feeding: and as this is known to succeed best in Nature, this is what Art should imitate.

The middle Ponds, in this String of them, should be of a somewhat greater Depth than the others, that the Pike, which grow large, may have a sufficient Scope of Water; all Fishes naturally requiring this in proportion to their Magnitude. But it will be convenient also in these to let the Head descend gradually, and to have Shallows purposely left in some Places, as was directed in the breeding Ponds. These will not only breed there themselves, but their Food the Roach, and other such Fish should be encouraged to breed also. This they will do on these Shallows purposely left, and in this Manner such a Supply will be rais'd, that the Pike and Perch will find their Food naturally provided.

Lastly, those Ponds intended for feeding Carp, and such other Fish, which are to be at the lower Part of the Row, should have the common Depth of six Foot, in a Manner throughout; but it will be very proper to have here and there a little Island standing in these; and in other Places to hollow away the Banks underneath, and to plant Willows, and other watery Trees along the Edges, that their Roots may bulge out into the Water. All these will serve to give Shelter and hiding Places to the

the Fish, without which they will never thrive as they ought to do. These Contrivances are very proper also for the middle Ponds in which the Fish of Prey are kept, for they love Holes and skulking Places more than any other: but in the breeding Ponds they are least needed. Though in Moderation, Shade and Shelter are convenient every where. It is a very good Practice to sink some small Faggots in different Parts of the Ponds, when new dug, for they will serve the same Purpose of sheltering, till some Weeds rise in their Bottoms.

In all these Things the great Rule is Moderation. If too many Trees be planted on the Banks, they do a great deal of Harm by the falling of their Leaves into the Water; and too many, or too large Islands left in the Ponds, take up too much Room.

C H A P. XLIV.

Of the stocking of Fish Ponds.

WE have observed that our Husbandman, who makes Ponds for the Sake of the Profit he is to gather from them, is to dispose them in a Row, and form them according to the several Purposes they are to answer. We are to suppose him thus far advanced in his Design. He has, we will suppose, eight of them in this String, and has contrived the first for breeding of Carp and Tench, the second for breeding Pearch, the two last for feeding his Carp and Tench, and the four middle ones for feeding his Pike and Pearch separately, according to his Discretion.

The Ponds are prepared, and he is to stock them. The four Kinds already named are the Principal that he is to regard. Trout will not thrive in standing Waters; in many they will not live, and in those where they do not die at once, they languish and have nothing of their true Flavour.

Eels are very well worth keeping in Ponds, but they need not have any kept on Purpose for them. They are a Fish of Prey like the Pike and Pearch, and they may be kept in the same Pond with either, for they hide themselves in such a Manner, that those Devourers cannot get at them: and they will thrive upon the small Fry that are kept there for the Support of the others. They will grow to a great Size in these Ponds, but they are not like the Eel of the River for Taste. The finest Eels in the World are those caught in the clear and shallow Trout Rivers: these in Ponds have neither their Flavour at the Table, nor their Look while living.

Some put their Pike and Pearch into the same Ponds, imagining that the Pearch will escape the Jaws of the Pike, because of his hard Scales, and prickly Fins, but this is a Mistake. Where there is Plenty of other Food the Pike will let the Pearch escape, because he prefers the Roach to him; but when Hunger calls upon that Fish, he is not nice in his Distinctions.

Some keep Fish of other Kinds in Ponds, as Chubs, Bream, Flounders, and the like, but they

answer no profitable or useful Purpose. Where Fish are kept for the Table only, these are of an inferior Kind; and where the Price they will bring at Market is studied, they are nothing in Comparison of the others. A Bream is not good for any thing till it is of a very large Size, and it will never grow to this under fifteen or twenty Years, and requires very deep Water: and when it is at its Perfection few know that it is good; and 'tis not the pleasant but the fashionable Dish, that brings the Money. If Gudgeons are kept it must be in the first Pond, where the Water is purest and clearest, but they come to nothing there; they are like the Trout, a Fish that naturally live in swift and shallow Rivers, and in Ponds they lose their Colour and their Flavour.

These Considerations fix the Husbandman to the five Kinds of Fish already named, as the principal for his Purpose, and we have shewn in what Manner these are to be distributed in his Ponds. We now come to give him some Directions, such as the concurrent Experience of all who have try'd confirms, for the breeding, feeding, and preserving them in the most profitable Manner.

The first Pond has been set apart for the breeding of Carp and Tench, which may breed as well as live together afterwards, for they will neither hurt one another when grown, nor devour each other's Spawn as most of the other Fish will.

Carp is the most profitable Fish the Farmer can breed, and 'tis therefore fit we begin with considering them, and deliver what relates to them most particularly. No Fish bears a better Price at Market of all that he can breed; and none spawns so frequently. When we add to this, that the Carp is of very quick Growth, we have comprised all that can be said in the Praise of a Fish to the Person who keeps it for his Advantage.

The Carp will breed at much shorter Intervals than any other Fish, and the young are vastly numerous: they require little Care, and are sufficiently hardy. The great Caution of the Farmer, in this Case, is to provide and keep up a sufficient Number of Breeders.

The female Carp never begins to breed till about eight Years old. The Male need not be more than five Years. The Purchaser must examine their Size and Condition, before he puts them into his breeding Pond, that he may not be disappointed. Many have condemned the Nature of their Pond, when the Fault has been in the Condition of the Fish from which they expected their Increase.

The Proportion of the Males and Females should be about one of the former to three of the latter; and not only a proper Number must be put in at first, but a watchful Eye must be kept that they do not decrease without Supplies, for the Carp often dies after spawning.

The Tench agrees in all these Respects with the Carp; and being put into the Pond with the same Regulations, the two Kinds will breed perfectly well together.

Into the second Pond are to be put the Pearch for the same Purpose, and with the same Cautions. They will breed when they are kept in the

the other Ponds, but they are so ravenous that they eat their own Offspring. And the only good Way of feeding them is when they are put into those Ponds nearly of the same Size.

As to the Pike they will sometimes breed in the Ponds where they are kept for feeding, but they more affect to do it in large Rivers. The Pearch will also breed in their Ponds, but in this Case few of the young come to any thing, for both Kinds feed upon their own. The Rule of putting in Fish nearly of a Size into the feeding Ponds, is as necessary to be observed with Respect of the Pike as the Pearch, for they will both devour such of their own Species as are smaller. A Pearch of half a Pound weight will seize one of a quarter of a Pound; and the Pike will lay hold of such as are very nearly as large as himself: he will prey upon any thing that he can get into his Mouth, no Matter whether he can swallow it. A Pike has been seen with a large one in his Jaws, swimming about till that Part which he had gorg'd was digested, that he might swallow the Remainder.

These are sufficient Reasons why the Fish of Prey that are put into Ponds to feed, should be as nearly as possible of a Size: and there is some Cause, though less, for the observing the same Rule with the others, for though they will not eat the smaller, they will starve them by not permitting them to get any Food.

There is no Way of matching the Size of the Fish so well, as by supplying the feeding Ponds from the breeding ones. For in these latter those Fish that are of the same Breed, must be equal in Bigness, and being put into the same Place, and having the same Food, they will keep up that Equality pretty nearly. As to the Pike, they are generally purchased, and the Care should be to buy them, as nearly as possible, of a Size, for otherwise the Number will decrease continually. When Pearch are bought, the same Caution is to be observed for the same Reasons. As to Eels, they need not be so carefully pick'd, for they are defended from the other Devourers, by their Place of Habitation, the Mud; and though they seize upon any other Fish that they can get at, they do not prey upon one another.

The Farmer must be cautious not to suffer his Geese or Ducks, with their young Brood, to come upon his Pike Ponds, for that voracious Fish will seize the young, while they are in the Down, as readily as he would a Roach or a Gudgeon.

When the Ponds are stock'd, the Owner should take Care that the Herons do not get a way of coming there, and be particularly guarded against Otters, if there be any in the Neighbourhood. These are the Enemies of his feeding Ponds; and there is one little regarded, but very destructive in those that are for breeding, this is the Stickleback. As contemptible an Enemy as this may seem, none is so destructive of the Spawn and the young Brood, and none so difficult to be conquer'd. I have known many Ponds that would have been excellent for breeding, spoil'd by this little Creature: and even the emptying them is hardly a Security; for these small Fish will live in the least Quantity of Water that remains in any accidental Hollow, and they breed

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so quick, and in such Numbers, that they soon are in a Condition to renew their Mischief. They lodge about and under the Stones where the Carp and other valuable Fish deposit their Spawn. They devour this wherever they find it, as their natural Food: and what escapes and hatches into Life, becomes their Prey in that Condition, for they are eternally catching the young Fishes.

There has been supposed a great Mystery in the Matter of breeding Ponds; and the best Judges have been obliged to refer themselves to Experience; only saying some will and some will not do for that Purpose, and there is no knowing but from Tryal. We have already named the wrong Age of the Fish, put in by some as Breeders, for one Reason of the failing; another is this little destructive Fish; and a third may be the ill-fashioning and constructing of the Pond. But let these three Articles be managed rightly, and the Undertaker will seldom fail. Let the Pond be made according to our Directions, with Shallows for the Spawn; let Fish of a proper Age and Condition be put in, and let there be no Sticklebacks; and there will never fail to be a Supply for the feeding Ponds.

The next Thing to be considered is the Numbers to be kept in the feeding Ponds, and this must be proportioned, in part, to their Extent, and in part to their Richness. A rich feeding Pond, of an Acre Extent, will every Year support very well two hundred Carps, of three Years old. If they be put in younger the Number is to be increased in proportion, the same Pond will as well feed three hundred Carp of two Years old, or four hundred of one Year old. If the Pond be less rich, the Number must be smaller, and if of the richest Kind of all, it may be somewhat increased.

Tench feed in the same Way as Carp, and may be put in after the same Manner: it is a very good Method to put in one third Part of the Number of Tench; or more, according to the Nature of the Pond: these two Kinds agreeing and feeding perfectly well together.

As to the Nature of the Pond suiting one or the other Kind, it depends in a great Measure, on the Soil at the Bottom. The Carp loves a loamy Bottom, and the Tench a muddy one. The Carp, in the same Manner, loves a new Pond, and the Tench an old one. The Carp is always found to thrive best where there are a great many Weeds, and good Shelter, and where there grows good Grass about the Edges of the Water: the Tench, on the other hand, loves a deep Pond, with a warm owzy Soil and hollow Banks; and delights in the Clusters of Flaggs that often run into the Water to a good Distance from the Shore.

These are the particular Conditions that suit a Pond to the one or the other of these Kinds of Fish; and from this the Owner will be led to conduct himself to the best Advantage, according to the particular Nature and Condition of his Ponds. If they be nearly alike, let him put Tench and Carp together into each, and proportion them according to the Nature of the Pond, adding to or diminishing the Number of the Tench, as the Pond appears, according to these Circumstances, to be more or less suited to them.

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them. If on the other hand one of the Ponds be very well suited to Carp, and the other to Tench, let him put all his Carp into one, and all his Tench into the other.

Although Tench and Carp be fresh Water Fish, they will thrive very well where it is a little brackish. This is a Consideration of great Consequence to those Farmers who are situated toward the Sea, or Salt Rivers. They often have Grounds of no great Use where Fish Ponds may be very well dug and supplied, but that the Water will not be perfectly fresh: they need not for this Reason be disheartened from breeding Carp and Tench; for they will succeed full as well there as in the most perfect fresh Ponds: the only Disadvantage is, that where the Water is too salt, they do not taste so well as in the fresh Water feeding; but where it is only a little brackish, they thrive rather the better; and the Difference is not perceived in the Flavour.



C H A P. XLV.

Of feeding, preserving, and taking Fish out of Ponds.

THE Farmer has now, we will suppose, put in his Stock of several Kinds into his Ponds; and he requires to know what there is more that he is to do in this Article of his Profession. They are to be provided with Food, preserved from Injuries, and at proper Seasons taken out for the Market.

As to the first Article, their feeding, we have told him already that requires little Care or Charge. The Pike and Perch in his middle Ponds are to be furnished with a Quantity of Roach, Dace, Gudgeons, and the like, the common Draught of every little River; but he must have his Eye upon them, that if they do not breed, which they frequently will, especially the Roach, he must at Times throw in a fresh Supply. As to his Carp and Tench Ponds, they in a great Measure supply the Fish themselves by the Richness of their Water, and by the Insects and small Animals that breed in them: but if at Times he throw in Grains, Blood, and the Offal of Chickens, their Guts, and the like, the Fish will feed the faster. The same may be thrown into the several breeding Ponds; the Grains into the Carp and Tench Ponds, and the Offal into the Perch.

This is all that is required on the Article of feeding, so that 'tis certainly as easy and as cheap as it has been represented.

As to the preserving the Fish from Injuries, we have already named the keeping away Herons and Otters; and a farther great Care must be to keep off Thieves, especially near great Towns, where there is a ready Market for what they shall steal: the keeping a good Watch, and the sinking Things in the Ponds in a proper Manner to prevent the drawing of them, are the great Security. But there is another Accident to be named here by which great Numbers of Fish are destroyed, that is the Frost.

People have seen that when the Water is altogether covered with Ice, the Fish languish, and

if this continue a long Time they die. For this Reason they break the Ice, and use such other Means to let in Air as they can, and this always has a good Effect: but there is one Thing farther Experience confirms, which is, that the Damage done by Frost is much greater in foul Ponds than in clean. For this Reason the Occasion of the Frosts doing Mischief should be prevented in Time. Ponds should be frequently cleaned, which, as has been said already, is an Article of Advantage to the Farmer rather than Expence, because of the Value of their Mud as a Manure. When they are thus kept tolerably clean, the Frost will have less Effect upon the Fish; and to prevent the Damage entirely, there should be a few Pipes laid into the Water in different Places, with their Ends above its Surface. Let the Frost be ever so severe, these will always keep a Communication with the Air, and with this Caution, and the Cleanness of the Bottom, the Fish will be perfectly well preserved from Accidents.

Some lay in Straw for this Purpose, but its Effect is not so certain: that of a few Pipes is obvious, and cannot fail. The frequent cleaning of Ponds beside this, is in all Respects serviceable to the Fish; and as it also serves the Farmers Purpose in a Supply of Manure, and answers its own Expence, there is all the Reason in the World to do it.

Lastly, for the taking the Fish out of the Ponds, there require a few Instructions: they are very short and easy, but the Necessity of them seems not very well known, for some Damage often happens for want of a Regard to them, and on some Occasions a great deal.

In the common Way of taking Fish out with Nets, a great deal of Mischief is done by Servants, hurting those which are to be thrown in again, by Blows; and by keeping them too long out of the Water: and in the other Way of draining the Ponds, a great Disturbance is made by letting the Water of one into another. Against this we have already proposed a Method, by a Ditch cut along the Side of the Ponds, which every one who deals largely in Fish, will find vastly worth his while to practise.

Once in three Years every Pond should be drained, and the Fish taken out and sorted, removing the larger and the smaller than ordinary, to keep up that Equality which we have shewn to be so essential an Article in the Management of every Kind.

The breeding Ponds are to be drained as well as the others; and from them are to be taken the young Fish of proper Size for the Supply of the breeding Ponds, in answer to the Quantity that have been taken out. And when this is done, the Remainder are not to be thrown into the breeding Pond again, for they will starve the Breeders: but they must be put somewhere to take their Chance, if they be not wanted on any particular Occasion.

On this Occasion great Care must be taken not to hurt the Breeders, either by Violence, or by keeping them too long out of the Water; and if the due Numbers be found deficient, they must be supplied with those of a proper Age and Condition.

In this Manner the whole String of Ponds will be kept in good Order, and yield the greatest possible Advantage: there will be a constant Supply from the one to the other; and these Creatures will answer as regularly to the Farmer's Expectations, as any other Part of his Stock.

Whenever any Fish are taken out for Sale, the Master's Eye should be over the Draught for two Reasons; it will keep in his Mind a due Knowledge of the Condition of his Stock, and he will see that no Hurt is done to such as are to be put in again.

We shall now add a few Observations in a general Way, and then close this Article.

If it happen that the Farmer have Convenience of digging a Pond where it shall have a marley Bottom, he may be sure of feeding Carps there to a very great Advantage. If he have Opportunity also of making a Pond in some Place where it shall receive the Washings of Sinks, or the Foulness from great Houses, or about large Towns, he may be sure in the same Manner, that both Carp and Tench will grow and fatten there in a surprizing Manner. If he have the Opportunity of making a Pond at the Head of a chalky Spring, he may feed Trout in it, and this is the only Condition of a Pond that can suit it to that Fish: but even here they will not succeed as in Rivers. If the Pond be dug in a Bed of Clay, or if he be obliged to clay it in order to make it hold Water, and it be found too cold for the more valuable Kinds of Fish, he may breed Flounders in it. They will take Care of themselves, and will grow to a great Size in it. They seem to thrive in such Ponds better than in Rivers, but their Taste is not so fine.

When Ponds are to be made in boggy and springy Places, where Carts cannot well come to get away the Mud thrown up in cleaning them, the best and most advantageous Method is to

dig them long and narrow, like Ditches rather than Ponds, that the Workmen may be able to throw out the Mud on either Side at a single Throw.

The Pike grows so fast, that it is very well worth the keeping in feeding Ponds, because of the quick Increase in Value. Pike of six Inches long may be had for a very small Price near large Rivers, and if put into Ponds with Plenty of Food, they will grow to fourteen Inches length the first Year, and the next to two or three and twenty Inches. If the Owner have a mind to fatten them, nothing answers the Purpose so well as Eels chop'd to Pieces: they will devour these greedily, and fatten upon them like Pigs. When the Pike grows to a good Size, and is in due Condition, he bears a good Price, but the constant and marketable Fish is the Carp. It is on this the Person who intends to make Advantage of his Fish Ponds, should principally rely for it; for none requires so little Trouble, or is liable to so few Accidents.

Among the several Kinds of Fish that he can keep, there is none so safe from the common Accidents as the Carp. It will endure Hardship of Frost and other Kinds, better than any; it is shy in a great Degree, so that it preserves itself from common Enemies, and no Fish is more difficult to be taken out by the common Methods of stealing. They will not readily bite the Hook when grown to a Size, especially in Ponds of the rich Kind, that have been recommended for the feeding them; and even the casting Net rarely surprizes them. They have a Way of plunging to the Bottom upon the first Notice of any Disturbance in the Water, and their Way is to strike their Heads into the Mud. In this Case the Net draws over their Tails, without laying hold of them. No Fish is therefore so secure to the Owner, nor any of such certain Sale in all Places.

BOOK V. PART IV.
Of INSECTS.

CHAP. XLVI.

Of Bees, their Nature and Products.

AMONG the Insect Kind there is but one Species with which the Husbandman at this Time has any Concern. That is, the Bee. A Creature which has this great Recommendation to his Notice, that is, to be kept with very little Expence, and less Trouble; and which at the same Time yields him two Commodities that are always marketable, and always bear a considerable Price, Wax and Honey.

Volumes have been written on the Bee before its Nature was so well understood as it is at present: Volumes therefore might be added, for with the more perfect Knowledge of its Nature, we have arrived at the Discovery of many other of its Properties: but we do not in this Work intend any where to expatiate for the Sake of

an idle Curiosity. That it is the Interest of the industrious Husbandman to keep Bees is plain, because they will bring him Profit, and naturally fall in the Way of his Profession; this therefore we recommend to him: and that he may be able to do it in the most advantageous Manner, we shall, as on all other Occasions, lay down the best Rules Experience has shewn for that Purpose. And as we have endeavoured to explain to him every Article of his Business, that he might always not only know what he ought to do, but why he was to do it; we shall in the same Manner lay before him in a few plain Words, on Account of this Creature, so far as he needs to know it, with the Nature of those Products which it offers to his Service.

The Antients supposed Bees to be produced from the corrupted Flesh of Animals, and they pretended to lay down Methods of procuring them

them by this Means: but all this is known to be an Error. VIRGIL advises the killing of a Bull Calf, and exposing its Flesh in a particular Manner for the breeding of Bees in it; but there is no more Truth in this than in Sir KENELM DIGBY's Receipt to make Crawfish, by burning and beating to Pieces others.

We know at this Time that all Creatures, the least as well as the greatest, are produced from the Eggs or Embryo's of their Parents, and that they can be produced in no other Manner.

In the Generation of Insects, Nature observes this constant Method, that all such as have no Wings, are produced from the Eggs of their Parents, or brought forth alive in their own Forms, whereas all those which have Wings undergo a kind of Change. These are hatch'd from the Eggs of their winged Parents, in form of Caterpillars, Worms, or Maggots; in which they live a certain Time, and then fall into a State of Rest, covering themselves with a Web or Case of their own making; or shrinking into their Skins which harden for that Purpose: and after they have lain a certain Time thus, they break forth in the winged Form like their Parents.

This has been supposed to be much more wonderful than it is; the vulgar have thought that it was a Change of one Creature into another; and the learned have adopted the Folly, as it were, under the hard Word Metamorphosis of Insects. But the Truth is, the Butterfly is in the Caterpillar, and only takes that Time to grow to its due Perfection.

As this is the Case with all winged Insects, the Bee being one of them, must have its Origin in the same Manner, and the Method is this. When the Combs are made, a Female Parent lays an Egg in every Cell, these Eggs hatch into a Kind of white Maggots, and after these have lived their Time, they fall into a State of Rest within the Cell, and in due Season the Bee bursts forth, and takes its Flight.

There is this very singular in Bees, that they are of three Kinds. In the Generality of Animals there is a Male and Female Sex, and no other Difference; but among Bees, there are Males, Females, and others of no Sex at all.

These last are the great Number, and go through all the Drudgery. The Males are but a moderate Proportion, and when they have performed their Office in impregnating the Females, they are driven out of the Hives to perish. The Females are very few, but each lays a vast Number of Eggs, and they are always taken great Care of in the Swarm. They are distinguished from the others by their Size and Shape, and have been called by the Names of Kings and Queens of the Swarm.

The two valuable Substances with which the Bees supply the Farmer, Wax and Honey, are both extracted from the Flowers of Plants. The Wax is somewhat altered by the Creature to bring it to that State, but the Honey they find in its own Form.

In the Flowers of Plants there stand up certain slender Threads, with little Lumps upon their Tops. These are in some more, in others fewer, and upon the Number of them is founded the pre-

sent fashionable Method of classing Plants. These Lumps or Knobs which stand thus in the Centre of the Flowers, contain a fine Dust, which serves to impregnate the Seeds of the Plant: but as Nature frequently provides for many Purposes in the same Thing, this Powder or Dust which is formed in a much greater Quantity than it is wanted for the Service of the Herb, assists the Bee for its Combs, in which to deposit its Honey and its young, furnishing the Materials of which Wax is fabricated by the Creature.

Toward the Bottoms of some Flowers, and at the Bottoms of others, there are also certain Cells, or Lodgments of different Kinds, Shapes and Forms, in the which is held a sweet Juice: this is Honey. This the Bee takes out, and has nothing more to do than to remove or carry it to its Cells.

This is the real and certain Origin of Wax and Honey. The Bee feeds upon the Dust which is found in these Lumps in the Centre of Flowers, and afterwards disgorges it for the Service of the Hive. It affords some Nourishment to the little Body of the Insect, and after that is carried off, and the Residue has undergone the Operation of the Creature's Stomach, it is Wax. With this the Combs are formed of that beautiful and useful Figure, and in the Cells of these is deposited the sweet Juice, which they collect from the Bottoms of Flowers, and which, without any Assistance from them, is Honey.

This is the History of that surprizing Insect the Bee, and thus much it is fit the Farmer should be acquainted with, for the rest it is matter of Curiosity, rather than of Use; and a great deal might be said very prettily, but very uselessly with Respect to him on the several Subjects. After this succinct Account of the Creature, and the Origin of its Products, we shall enter upon the useful Part; the best and most advantageous Methods of managing them.

C H A P. XLVII.

Of Hives, and the Manner of placing them.

THE Bee in the natural Course and Conduct of its own Life, joins its Fellows, which collect together into a Swarm, and make of the Wax they thus collect and prepare from the Dust of Flowers, certain Cells, which being joined one to another, form the Combs; and in these Cells they deposit the Honey they take from the Bottoms of the same or other Flowers.

In their State of Nature they place these Combs in the Hollow of a Tree, or some such Cavity, into which the smaller Entrance the better for their Safety: in order to make the most commodious Advantage of their Products, Men have contrived Places of Reception for their Combs, into which they tempt the Bees to come. These are Hives, which in different Places, and at various Times, have been contrived to be made of several Forms and Materials; but the usual Kind at present are made of twisted Straw, and none answer better. A great many

many Sorts have been devised for Pleasure, and the Curiosity of seeing them work; but for the plain Use and Advantage to be had from the Creature, none answers better than this common Kind, nor is any other worth the Husbandman's Regard.

There have been many Contrivances of late to save the Bees when the Honey is taken; but these are not necessary; for a proper Management with the common Hives, placing one over another for the Reception of the Creature, will answer all the same Purposes. We do not say that this will answer all the Purposes that are pretended to be answered by the others: but all that they really effect.

The Form and Fashion of the common Straw Hives is sufficiently known; but they are often made too high for their Width. The best Size is such as would hold about six Gallons, and the Husbandman will do well to order these to be made a little more squat than the common Practice allows.

Beside these there should be some of a smaller Size for the multiplying the Stock of Bees, and receiving the little Swarms; and it will be right to have a few larger, that they may be in Readiness for an extraordinary large Swarm.

The Hives must be trimmed as smooth and even as may be, cutting off all staring Straws, and the Spleets are to be then put in, three or four descending from the Top to near the Edge, and a Couple of others to support the Opening or Door, and two more behind: these last are to be thrust firmly into the Substance of the Hive, to keep it from sinking when it is full.

The Hives being thus prepared for the Reception of the Bees, the next Consideration is that of finding a fit Place for setting them: for the Bee is tender in its Nature, and the whole Work will proceed greatly the better, for a little Care in the setting out.

Let a Spot be chosen not far from the House, and well defended from Winds every Way. The best Security of this Kind is by proper Hedges; and these should be so contrived as not to keep out the Sun; for the Bee requires Warmth, as well as Stillness. The Place must be well defended against Cattle, both for the Bees Sake and their own; for these little Creatures hate Disturbance, and they generally resent it very severely. The best Situation is when the House, or some large Building, stands to the North, that it may be perfectly defended on that Quarter, and the Opening is to the South, to let in the best Rays of the Sun. There should be also some Trees pretty near to receive them at the Times of their swarming.

The Place being thus chosen, let there be set up a Parcel of Stools for the Hives to stand upon. The usual Method is to set several together on a Bench, but it is not so well. It occasions a great deal of Confusion among the Bees, who often mistake one Hive for another, and in Winter they will quarrel about it, and do one another a great deal of Mischief.

The Stools should be made of Wood, for when cover'd with Stone they are too hot in Summer, and too cold in Winter. They should be raised about a Foot, or a little more from the

Ground, and placed not exactly upright, but a little slanting, that the Water which falls on them may run off. On the Top they should be about an Inch broader than the Bottom of the Hive; and in Front just before the Door of the Hive, they should have an Extent of the Bigness of one's Hand for the Bees to settle upon when they come home loaded. These Stools should be set in a Row from West to East, and they should point South, a little inclining to the West, that the Body of the Hive may break the East Wind from the Door.

For yet farther Security, these Stools, with the Hives upon them, may be inclosed in a little boarded Building, either singly, or several of them together; which may have a tiled Covering to keep off wet, and Doors to shut or open according to the Severity or Mildness of the Season.

This is not a Thing of absolute Necessity, for People keep Bees to a great Advantage without such Trouble; but it is right, and what I would advise the Husbandman to do; for the Expence is little; and in this, as in every other Article of his Stock, those Things which will of themselves succeed very well, will bring him in larger Profits in Proportion to the Care he bestows upon them. In general, whatever Methods are used to guard against the Things that injure Bees, the two greatest of these are cold and wet; and of those two the latter is the greater.

The Winter is the Season in which Bees are most liable to Injuries; but these they in a great Measure escape if their Hives be well made, and well defended, and they will keep within them. Any Thing of a Building about the Hives serves to darken as well as to shelter them; and this in Winter is of great Service, for it prevents their going out at every Time when the Sun happens to shine a little, which they otherwise are too apt to do, and so are killed by the Cold while they are abroad.

It is for this Reason the greatest Number of Bees perish in the mildest Winters. This sounds odd, but they keep within the Hives in very severe Seasons, and are there safe, whereas they go out in these mild Days and perish.

When Bees are thus kept dusky and sheltered during Winter, the Doors are to be thrown open early in Spring, to promote their Industry and their Breeding.

At the Time of the Bees swarming, the Hives intended to be used are to be rub'd with Thyme, Hyssop, or Bean Tops, which will please the Bees, and it is a good Method to rub a little Honey on the Inside.

The Hives are to be plaistered down to the Stools with a Mixture of Cow Dung, Sand, and a little Lime, this must be carried round the Edges to keep all close, and fence out the Wind; and in the Winter the Door of the Hive should be stopped with a small Piece of Board that has two or three Notches in it to let the Bees through, and not large enough to let in any Thing that would hurt them.

C H A P. XLVIII.

Of the swarming of Bees.

WHEN the Bees encrease, so that they are too many for the Hive, they naturally swarm. The Time of their doing this is the Beginning of Summer, and this is a Season at which the Owner is to watch them with a particular Care, for the Encrease of his Stock and his Profit depend principally upon his Management at this Juncture.

It is plain that the Fullness of the Hive is the Reason of their swarming, because they sometimes get a Way of lying out of the Hive, under the Stool or behind; and in this Case, not perceiving the Hive to be full, they will not swarm, although their Number is greater than in other Hives where they swarm, because they keep within.

The swarming of Bees depends upon many Accidents, and none more affects this Article in their Economy, than the Weather. In a mild and calm Spring they swarm early: in a cold and backward Season they do not swarm well; and what they do in it is later.

Toward the Middle of May, if the Season favour, the Owner is to watch the Hives to be prepar'd for their swarming. When the Drones are thrown out early, it is a Sign the Hive is full; and when, after this, the Bees are seen continually in Clusters about the Door, and often lie out; and when there is some Moisture about the Foot of the Hive, at times, and they hover in great Numbers together round the Door, it is always a Sign of swarming. When there happens a warm Gleam of Sun, after a slight Shower in the Middle of a calm Day, they may be expected to take that Opportunity of rising; and if, just after this, they be seen hanging in Clusters, about the Door of the Hive, it is to be immediately expected.

If the Weather prove stormy when the Bees are ready to swarm, it will prevent them; and if this happen from time to time, they will be put off entirely, and the Opportunity lost for that Season. Sometimes also, in extremely hot and dry Weather, they will be so continually out, and so many of them together, that not perceiving the Fullness of the Hive, that also will prevent them from swarming.

As their own Sense of the Fullness of the Hive is a great Reason of their swarming, the Owner should take all Opportunities to force them in, in good swarming Weather, when they lie out at the Door. He should also shade and cool the Hive at these Times, if the Weather be very hot. At the same Time, if those which hang about the Stool be gently mov'd off with a Brush, it will cause them to rise, and the Noise of several of them flying up together, will sometimes call up the others, and make them swarm.

When the Bees lie out in great Numbers it is a good Method to raise up the Hive, and let them all in, and then fasten down the Sides with Cow Dung and Sand beat up together, leaving only the Door open. This will make them per-

ceive the Fullness, and they will often be led to swarm almost immediately.

The good Women have many idle and superstitious Customs for making Bees swarm: but these are founded upon Reason, and the Nature of the Insect; and if these do not bring them to it, they will rarely be made to do it any other Way.

One Swarm not sufficiently unloading the Hive, at eight or ten Days Distance, there is another ready. These are what they call After-Swarms, and they always know of their coming out by the Noise. They seem to call one another forth with a sharp and shrill Note, and presently rise in Numbers.

When the first Swarm happens to be broken, the second will sometimes come the next Day, and after this there will come a third, and sometimes a fourth; but all this usually happens within fourteen or fifteen Days.

There is no Subject on which the Country People have been more superstitious than this of Bees, but we wish to break through those idle Customs. One of these is, that as soon as the Swarm is risen, they ring upon a Kettle or Pan, and make as loud a Noise as they are able; they imagine this assists the swarming, and brings them down, but nothing is more contrary to Reason. Their swarming is an Operation in the Course of their Nature, and all that is to be done is to let them be quiet while they are about it: all Noise disturbs them, and they should never be interrupted. If there be any Danger of their wandering, a little Dust is to be thrown among them, and it never fails to quiet them, and bring them down.

The beating upon Kettles and Mortars was probably invented only as a Signal to the Neighbours, that such a one's Swarm was up; they who invented it did not know that it was of ill Consequence, and they have been followed in it by those who have imagined it to be useful.

Sometimes one Swarm of Bees will cast another in the same Year; this is an Article of which the Husbandman cannot be so well aware, as of the first and more certain swarming; but he is to watch as soon as he sees the first Signs of it, and follow them in all Respects as the first Swarms, getting them into an Hive according to the Directions to be given in the succeeding Chapter.

When it happens that the Swarm parts, he is to conduct himself according to the Distance at which the two Bodies settle.

If they be within Sight of one another, the best Way is to disturb the lesser Cluster, and they will rise and go to the greater: if they be out of Sight they must be hived separately.

C H A P. XLIX.

Of the hiving of Bees.

WE have, in the preceding Chapter, directed the Husbandman in what Manner to prepare his Hives for the Reception of the Bees: these being ready, he is to get them into them in

in the following Manner. He is to watch the Swarm till they have fix'd upon the Place where they shall light : they soon begin to cluster together there, and when they are clung one to another, and well settled, and the whole Company are met, they are in a Condition to be got into the Hive.

According to the Bigness of the Swarm he is to chuse a larger or smaller Hive, and his great Care is to get them properly into it. The Bee is a Creature that will bear some Disturbance without Resentment, but they must not be too far ruffled ; when they are angry their Sting is a very severe Weapon. It may always happen that some of them may be provoked in this great Article of hiving, and for that Reason the Person who undertakes it should be prepar'd against the Danger. Let him have a Net wove, with the Meshes so small that the Bee cannot get through them, and large enough to be put on over his Hat, and fall down upon his Shoulders. His Face and Neck will be thus perfectly defended, and he will be able all the while to see what he is doing : let him put on a thick Pair of Woollen Stockings, and a Pair of Gloves of the same Stuff, which it will be best to draw up pretty high upon his Arm. When he is thus defended, let him go to work sedately and softly, for any hasty Motion disturbs and angers the Bees.

Let a Cloth be spread upon the Ground near where the Bees are settled, and the Hive laid upon it. Their common Place of alighting is the Bough of a Tree, and if this be a small one let the Husbandman approach softly to it, and gently cut it off ; let him take it down quietly and lay it upon the Cloth, and set the Hive over it. This is the most familiar and easy Way, and none succeeds so well : when the Bees have settled upon a larger Bough, or otherwise disposed themselves, so that this Method cannot be taken, the Husbandman is to shake them off into the Hive, and then to set it upon the Cloth spread for that Purpose. If they happen to light near the Ground, the best Way is to draw the Cloth under them, and then shaking them off, cover them with the Hive. When any Number gather at some little Distance from the Hive, he is to move them gently toward it with a Brush ; and if they take to any other Place, he is to wipe them off with the Brush, and rub the Place with something disagreeable to them, as Wormwood, or stinking Mayweed. Finally, the Swarm is to be set as near as can be to the lighting Place, and all left to be quiet.

Sometimes the Swarms come late, and are small, the best of them not sufficient to fill the least Hive, in this Case the Husbandman is to put two or three of them together in one Hive ; for otherwise they will be poor, and liable to Accidents, and will rarely come to any thing. If two or three of these follow one another, though not on the same Day, still let him take them one after another into the same Hive, and by thus joining them, and forming a tolerable Body, they will become industrious and be able to defend themselves, which singly they would not do.

The Method of joining these several little

Swarms is this. Near the Stool where the united Swarm is to stand, spread a Cloth upon the Ground in a calm still Evening, when it grows dark ; then set two Supporters for the Hive, and knock down the Hive out of which the Bees are intended to be removed ; then lift it up, and clapping it between the Hands, to get out the Bees that stick to its Sides, lay it down on one Side by the Bees ; and over them set the Swarm to which they are to be added, placing their Hive upon the Supporters. They will naturally rise into this Hive, where they will join the Bees that are in it ; and if any remain about the empty Hive, it is only disturbing them, and they will follow the rest, and the two Swarms will become perfectly one. In this Manner also another Swarm may be added to them, and one Hive may be thus well fill'd with those Swarms, that would have succeeded very badly in two or three. When the Bees are all got in, let the empty Hive be taken away, and the full one plac'd upon a Stool that Night, or the next Morning early.

There is another easy Method of uniting two Swarms, or more, which is this. Let the Hive into which a small Swarm has been taken, be turn'd Bottom upwards, and in that Manner fix'd to the Bottom of the other Hive with its Swarm, fastening up the joining of the two. The Bees in that which is undermost will fly up into the other, and then the lower one may be taken away. In this Manner a second or third small Swarm may be added to the first, till it be increased to a proper Quantity. But this must be done before the Bees have begun to make Combs in the Hive they are removed from ; for when they have once set to work they are unwilling to quit it. For this Reason whatever Method be taken of joining of Swarms, the sooner it is done always the better.

Less Time is to be suffer'd to pass on these Occasions, than those unacquainted with the Nature of Bees might imagine, for as soon as they are settled in the Hive they get to work, and in a very few Days they make a surprizing Progress, forming in that Time large and compleat Combs.

When an old Stock of Bees is to be removed from one Place to another, a proper Season, and a proper Day are to be chosen for that Purpose, and it is to be done with a great deal of Caution. The Beginning of OCTOBER is the best Time, but it may be done in FEBRUARY, or any Time in the Winter ; but fair and still Weather should be chosen for the doing it ; and an Evening is the best Time, when the Bees are quiet.



CHAP. L.

Of the preserving of Bees.

THE Bees, for the greatest Part of the Year, provide perfectly well for themselves ; but in hard Seasons they are to be assisted, they will repay the Owner's Trouble with Interest, and the Food he is to give them is not expensive, when the Smallness of the needful Quantity is considered.

One Article that makes this the less expensive

is, that the Number of Bees at the Time when this is wanted, is not nearly equal to what it is at other Seasons of the Year. 'Tis only in Winter they require Assistance, and their Number is by that Time greatly decreased by their Deaths, since the Time of their swarming. A great many die toward Autumn, and many more as the Weather grows more severe, so that by that Time they want Food, the Number is much reduced that is to eat it.

Beside, the feeding them in Winter when their own Store fails; it is often very proper to do it in Spring, when the Stock of Honey is small, and the Quantity of Bees large, as will sometimes happen at this Season from unfavourable Weather. Nothing is then better worth while than to feed them; and the best Way of doing this, is by conveying the Food in a Cane, or little Trough, into the Hive. Many Kinds of Food have been contrived for them, but the best I have found on repeated Experience, is a Mixture of Honey with sweet Wort, or new Beer, and a little Bay Salt: this not only gives them the needful Supply of Nourishment, but always makes them healthy and vigorous. Some give Bread sopped in Ale, and they will eat it greedily: the Honey is, however, certainly the best, because it is the most natural Food: the Mixture of Salt I first tried, from observing that Bees succeed better in the Neighbourhood of the Sea, or Salt Rivers, than in any other Places; and since the Success of this Food, I have always made it a Custom to set a Pan of Water, with a little Salt in it, near the Hive.

The Season of Spring feeding is in MARCH. This is the Time when they begin to breed, and if they have had a bad Season and want Food, they cannot attend as they ought to do, to the great Affair of producing their Young, which is of all Considerations relating to them, the most important to him who wants to increase his Stock.

The Bees that want Food in the Winter very often do not deserve it; but these always repay the Obligation largely.

We have shewn the Husbandman what Methods he is to use for the keeping his Bees alive at all Times, and making the most of their several lesser Swarms; but we are yet to remind him of guarding them against such Things as are naturally offensive to them; and preserving them from many Things that would destroy them.

Quiet is a great Article in the Care of Bees, therefore all Noise and Disturbance are to be as much as possible kept from them. We have already directed that Cattle should be kept away by good Fences, and for this Reason the Place of their setting them should be far from public Roads, or Cartways.

Smoak is very destructive of them, and they are always to be carefully defended from it, especially that Smoak which rises from the burning any Thing upon the Ground, for it is easily driven by the least Wind just upon them, being on their Level, and it chokes and destroys them. All bad Smells also do them Harm, and render their Habitation disagreeable.

After these Considerations, he who keeps Bees is next to take Care that they be not exposed to

the Insults and Destruction of their several Enemies, Field Mice will destroy them, and Birds of many Kinds will devour them: Care must be taken to destroy and keep these away.

In Years wherein Wasps and Hornets are numerous, they do great Mischief, entering the Hives, and plundering them of the Honey; but it is easy to guard against these, by setting Vials of sweeten'd Cyder near the Hive, nothing tempting the Hornet and the Wasp so much.

Beside these foreign Enemies, the Bees are often very troublesome, and destructive to one another, by fighting. One Way to stop this Mischief is by closing up the Hive: but if Matters be too far gone to admit this Remedy, the sprinkling a little Dust among them answers the Purpose.



CHAP. LI.

Of taking the Honey and Wax.

THE Husbandman keeps Bees for the Sake of their Honey and their Wax. He has seen the necessary Methods of feeding and preserving them; we now come to the Article which is his immediate Concern, the making his Advantage of their Products.

Of the Wax they make their Combs, and in the Cells of those Combs they deposit their Honey. The Wax not being eaten would remain uninjured in the Hive during the Winter; but this is not the Case with the Honey. It is the Store they lay up in Summer for the Provision of that Season; and the Way for obtaining it in the largest Quantity, is to find the exact Time when the Combs are fullest.

All the Summer they are collecting Honey: in AUGUST the Combs are fullest, and from that Time the Bees often eat more than they get, so that the Quantity decreases. This points out the End of AUGUST very plainly, as the Time at which there is most Honey in the Hive: that therefore is the proper Season for taking it.

The old Way is to kill the Bees, and take their Produce at this Season: but many Methods have been invented for saving them. However, as there is not any great Purpose answered by preserving them when their Food is taken away, unless more Care and Trouble be taken about them, than it is worth the Farmer's while to bestow; I shall advise him to follow the old Method, and destroy the Swarm when he has taken their Stores. This Practice is not so cruel as it appears, for the Life of the Bee is very short naturally; and with the best Management they pass but an uncomfortable Winter after they are robbed of their natural Provision.

At the End of AUGUST therefore let the Husbandman consider what he will keep, and what he will kill. In this he is to be directed in a great Measure by the Age of the Swarm, the best to keep being those of one or two Years standing; or those of three or four Years, which, by Reason of their swarming the last Summer are full of Bees, and are the most likely to be good. The Swarms of three or four

Years

Years old which have cast Hives are to be killed, because they are not like to continue; as are also those poor Swarms that are not worth the feeding; and all light Stocks, and such as do not carry out their Drofs, or drive away the Drones in good Time. These are the principal Rules for the Farmer's Conduct in this Matter, and to these may be added, that he should take for killing all such as are three Years old or upwards, that have missed swarming the two preceeding Years, and such as are weak and easily plundered. These are the Directions he is to follow in the taking them, and he is not to omit the Temptation of a large Store, whatever be the Condition of the Hive: therefore if he perceive any to be very full, as they will sometimes in good Years be down to the Bottom, he must take these, for they never can be better, and often one such Hive is worth three.

When the Hives that are to be taken for the Honey are marked, let there be a Hole dug in the Ground of about nine Inches deep, and nearly of the Bigness of the Bottom of the Hive, with the fine Mould piled up round the Brim. Having this Hole prepared, about two Hours before Sun set, take a Brimstone Match as long and thick as a large Skewer, fix it in the Slit of a small cleft Stick, with a sharp Point. Stick this in the Ground at the Bottom of the Hole, so that the Top of the Match may come within an Inch of the Level of the Rim: if one be not thought sufficient, another may be added, prepared in the same Manner. Let the Top of each Match be lighted, and then set the Hive over the Hole. Draw the fine Mould about the Edges to keep in the Smoak, and thus let it stand a Quarter of an Hour. In that Time the Bees will be all dead.

The Hive is now to be taken into the House, and the Combs are to be carefully separated, taking them out one by one. The dead Bees are to be brushed off with a Feather, and when that is done, the Combs are to be broke each into three Pieces.

There will a good deal of Honey flow naturally out of these, and this is to be kept by itself. It is called Virgin Honey: but the same

Name is also given to the first Honey of any Swarm. Let this Honey be put in a Pot, and set by two or three Days; in this Time if there be any Mixture of Wax or other Foulness among it, that will work to the Top in a kind of Skum, and is to be taken off.

After the Combs will run no longer, they are to be pressed, and this Way they afford a large Quantity of what is called common Honey. The Combs after they have been thus pressed, are to be washed, and when all the Sweetness is out of them, they are to be worked for Wax. The Liquor in which they are washed, and the coarser Part of the Honey, are usually made into a kind of Mead.

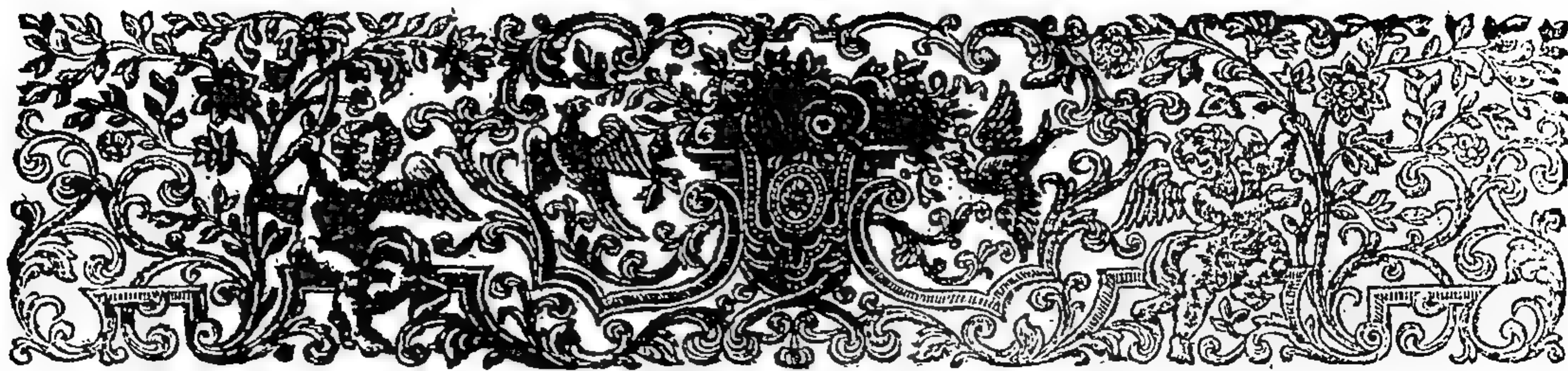
The washed Combs are to be set over the Fire in a large Kettle of Water, and boiled, stirring it continually about to prevent burning to the Bottom or Sides of the Kettle. When the Wax is well melted, pour all into a Strainer, and immediately put it into a Press, setting a Vessel of cold Water under it; into this let the Wax fall; and let the Pressing be continued as long as any Wax can be forced out.

When all is thus got that will come, let it be taken out of the Water, and moulded and worked up into Balls in the Hands; and after this let these Balls be broken to Pieces, and set over a gentle Fire to melt. Let the Wax be skimmed as the Froth rises, and when thoroughly melted, and well skimmed, let it be strained slowly through a Canvas Bag, and received in an earthen Pan, or other Mould, which is to be first rub'd over with a little Honey.

When all the Wax is run through, this is to be set to cool very gently in a tolerably warm Room, and when thoroughly cold, and taken out, the Bottom is to be pared off, and it is ready to be sold.

This is the plain and useful Way of managing Bees, and making the most of their Produce. A great many very ingenious Contrivances have been made for the Curiosity of Persons of Speculation; but nothing more than this need be regarded in Practice, when the Profit and Advantage are the Objects of the Attention.

End of the FIFTH BOOK.



A
COMPLEAT BODY
OF
HUSBANDRY.



BOOK VI.

Of TILLAGE. In SIX PARTS.

I. Of Plants, and their Nourishment.

CHAP.

1. Of the Roots of Plants, their Kinds and Forms.
2. Of the Extent of Roots.
3. Of the Manner of Roots receiving their Nourishment.
4. Of the Importance and Use of the Leaves of Plants.
5. Of Accidents arising from the Loss of Leaves.
6. Of the Nourishment of Plants.
7. Reasons for supposing the Nourishment of all Plants the same.
8. The Objections against the Nourishment of all Plants being the same, consider'd.
9. Reasons for it deduced from the Practice of Husbandry.
10. The Result of Experiments on Vegetation.
11. Of the changing of Crops.
12. Of the Distribution of the Nourishment of Plants in the Earth.

II. Of the Advantages of Tillage.

13. Of the several Methods of dividing the Particles of the Earth.
14. Of the Degrees of Tillage, and of the Use of Dung.
15. Of the joint Advantages of Manure and Tillage.
16. Of the Preparation of Wood Land for Corn.
17. Of the Preparation of heathy Land for Corn.
18. Of the Preparation of Land for Corn after the artificial Grasses.
19. Of the Preparation of Land for Corn after common Grass.
20. Of keeping Land in Heart by Tillage.
21. Of the Nature of the Improvement by Tillage.

III. Of the Implements of Husbandry, and their several Uses.

CHAP.

22. Of plowing.
23. Of the Form of the antient Plow.
24. Of the several Kinds of Plows in common Use in ENGLAND.
25. Of the Uses of the common Plows, and their proper Make.
26. Of the Improvements on the common Plow.
27. Of the Wheel Plow.
28. Of the four coultered Plow, its Make and Use.
29. Of the Management of a Plow in working.
30. Of the Advantage of Plowing crosswise on hilly Grounds.
31. Of laying Lands in Ridges.
32. Of the wet Land on Hills.
33. Of the wet Land which lies level.
34. Of the Advantage of Tillage by the four coultered Plow.
35. Of the general Benefits and Advantages of Plowing.
36. Of the Benefit of converting Pasture into Arable Land, and of continued plowing.
37. Of harrowing.
38. Of the various Kinds of Harrows.
39. Of the Drill Harrow.
40. Of Rolling.
41. Of the several Kinds of Rollers.
42. Of the great Advantages of Rolling.

IV. Of the different Manners of Sowing.

43. Of Sowing in general.
44. Of the Depth at which Seeds are to be sown.

45. The

45. *The practical Method of finding the proper Depth for Seeds.*
46. *Of the Quantity of Seed to be sown in the common and drill Husbandry.*
47. *The Practice of different Places in Respect of Quantity.*
48. *Of the Advantages the Drill Husbandry receives from the Hoe Plow.*
49. *Of changing the Seed.*
50. *Of the supposed Change of Species.*
51. *Of the Effect of different Soils on the Growth of Plants.*

V. *Of Drill and Horsehoeing Husbandry.*

52. *Of the Nature of Drill and Horsehoeing Husbandry in general.*
53. *Of Drilling.*
54. *Of Horsehoeing.*
55. *Of the Benefits of deep Hoeing.*
56. *Of the different Appearance of Crops.*
57. *Of Drill Boxes.*

58. *Of the Wheat Drill and Turnip Drill.*
59. *Of the Hoe Plow.*

VI. *Of the Benefits of Drill and Horsehoeing Husbandry.*

60. *Of raising Turnips by the Drill and Horsehoeing Husbandry.*
61. *Of the Disposition of a Turnip Crop.*
62. *Directions for Horsehoeing of Turnips.*
63. *Of the Quantity of Seed, and Advantages of the Crop.*
64. *Of raising Wheat by the Drill and Horsehoeing Husbandry.*
65. *Of the Number of the Rows for Wheat.*
66. *Of the Manner of Horsehoeing of Wheat.*
67. *Of the immediate Benefit of broad Intervals.*
68. *Of raising Saintfoin by the Drill and Horsehoeing Husbandry.*
69. *Of the Manner of sowing of Saintfoin.*
70. *Of the certain Advantages of the Drill and hoeing Husbandry.*



THE INTRODUCTION.

Of Improvements in Husbandry, and the Manner to undertake them.



E now enter upon the greatest Article within the Compass of the Farmer's Business: a Subject of the utmost Concernment and Importance to the Publick, as well as to his private Consideration; and though the most continually practised of any, the least understood of all.

We have throughout this Work endeavoured to acquaint our Husbandman with the Reasons of his several Practices, and shall more particularly than on any other Occasion, attempt it here; because there is no Part in which Improvements are more wanted, nor any in which they are so easily made: while at the same Time they are in this Article of much greater, and more general Advantage than in any other.

There is but one Way of rationally setting about Improvements in Husbandry: this is by understanding as well as by observing the Practice of others, and applying what may be discover'd from such reasonable Experience, to other and farther Parts of the Subject.

It is for this Reason we have hitherto been careful to explain the Nature of the several Operations we have described, that they might serve not only as Guides by which to work, but as Principles whereon to reason: and it is by this Method, and this only, we shall endeavour to enlarge the Knowledge of the Farmer on this most important Head; that he may know in what Manner to undertake whatever Reason and the Consequences of others Experience, shall shew him to be practicable, at the same Time that it points out the certain Utility and Advantage of it when achieved.

We have in the five preceeding Books instructed him in the preparing, planting and stocking his Farm; omitting, as we hope, no useful Knowledge on those Subjects: he is therefore now prepared to enter upon the Tillage of

his Land; and, according to the general Information conveyed under the preceeding Heads, he is to consider by what Method that may be set about to his best Advantage.

The old Practices of Husbandry had their Use, for every Kind of Tillage adds to the natural Fertility of the Ground; but in the Course of an Employment followed by so many Persons, in so many Places, and for so long a Period of Time, it is not to be doubted but Improvements must have been made. To resolve to adhere only to the old Methods, were to shut the Door against Knowledge; and to admit all that have been proposed among the new, were to perplex instead of informing ourselves by Experience.

All Sciences are rude and imperfect at first, and they by Degrees refine and arrive at more Perfection. The greatest Advances are made in them by frequent Practice; and none admits so continual Experience as this. Among the many who follow it, the far greater Part think no farther than to imitate the Labours of their Fathers: and of those who have had the Spirit to pursue the Subject farther, too great a Part have been carried away by Fancy, and have laboured rather to establish some new System, than to add to real Knowledge. These are to be little regarded: but, on the other hand, too much Respect cannot be shewn to those who have followed Utility in their Studies, and adhered to Truth in the delivering the Result of them to the Publick. 'Tis from these we are to hope for real Improvements in this Art; and we shall find in their Writings the best Foundation on which to build our reasonable Attempts for the carrying Agriculture to a greater Perfection.

Among the Writers who may be useful in furnishing Instructions for the Improvement of this Art, there is not one who deserves greater Praise than Mr. TULL, the Author of the famous Treatise on Horsehoeing Husbandry. This Gentleman has not only been of Service, but has done Honour to his Country, for the greatest Respect

Respect has been shewn to his Writings, by those who cultivate useful Studies in every Part of EUROPE. The Method he has proposed, has in it a great deal that is new, and in the highest Degree useful; but there are Faults as well as Excellencies in his Book, and while we give it the due Praise, we are to caution the Reader against too close an Adherence to all its Propositions.

This Author had a great deal of Experience, the true and rational Source of all Knowledge on this Subject; and he had directed his Pursuits upon a new Plan. He has furnish'd innumerable Hints for Improvements, and has carried many of them himself to a great Degree of Perfection: but he is too fond of the System he wrote to establish; and the new and useful Discoveries with which his Treatise abounds, are clouded by vague Reasonings, and often buried in a tedious Prolixity. This impartial Account we have thought it necessary to give of so late, and so considerable an Author, to whom we shall be obliged for a great deal of useful Knowledge on the Subject which we are to treat in the present Part of the Work: whose useful Discoveries we intend to present to the Reader, without his Errors or his Partiality; as they have been approved or condemn'd by those Foreigners who have adopted the Practice, and as they stand confirmed or contradicted by Experience.

It is to this ingenious Writer that we owe the Establishment of Horsehoeing Husbandry practised in some Parts of ENGLAND at this Time, and with great Success in many other Countries. We shall treat this Improvement in the Cultivation of Land carefully, as it contains more real Matter of Use than any other which has been made: but in our Observations on this Head, we shall form the Advice we shall give to the practical Husbandman, not upon this or any one Author alone, but upon the Result of their several Opinions, and of the Experience of those who have brought their Proposals, in whatever Branch, to Trial.

Mr. DU HAMEL in his Treatise on Cultivation, has adopted what was useful in Mr. TULL; adding what he had farther discovered, and retrenching his Errors: what he did by Mr. TULL we shall do by him. It is thus the Writings of one Author are made useful by the Labours of another.

The Horsehoeing Husbandry to be described in the succeeding Chapters, seems to have owed its Origin to a long neglected Passage quoted by Mr. EVELYN. The most celebrated Authors we find are not the most read; the Passage is this, "Take

some of the most barren Earth you can find, powder it well, and expose it abroad for a Year, stirring it about frequently: it will become so fertile as to receive and nourish a Plant from the INDIES, and will cause all Herbs to prosper in the most exalted Degree, and foreign ones to bear their Fruit as kindly as in their natural Climates."

If we add to this remarkable Quotation the Contrivance for sowing, invented by LUCA-TELLO, an ITALIAN, and published in the sixtieth Number of our Philosophical Transactions, which in the essential Points agrees perfectly with that proposed by Mr. TULL; we shall find that the Foundation of Horsehoeing Husbandry has been long since laid, and shall wonder that what had been so plainly delivered in Books, was not before brought to Practice.

The Use that has been made of these Discoveries and Inventions since, and the Improvements that are now carrying on in many Parts of EUROPE, by the Practice of Horsehoeing Husbandry, shew the great Utility of Books in proper Hands: nor does the Inventor or the Writer deserve more Praise, than the Person who brings what they have devised into real Practice.

In our Consideration of the Tillage of Land, we shall fully explain the great Improvement of Horsehoeing Husbandry, taking that latest invented Method first into Consideration, as there will be Opportunities of explaining the Nature of Tillage more from it, than from any other; and as in order to the entering into the Advantages of this, or any other Method of Husbandry properly, there should be first conveyed some general Knowledge of the Nature of Cultivation, and of the Benefit the Earth receives from it in the affording Nourishment to Plants; we shall premise some general and particular Observations on this interesting Head. For the better understanding of these, we shall begin with explaining to the Reader, who is not accustomed to these Researches, the Nature of the Vegetables themselves.

In order to understand in what Manner Nourishment may be conveyed to the Roots of Plants, he should first be acquainted with the Nature of those Roots which are to receive it. For this Reason we shall follow the Method of those who have written most rationally on this Subject, and premise to our Observations on the Manner of cultivating Land; some Remarks upon the Nature and Texture of the several Parts of Plants as they regard the present Enquiry; considering them only so far as their Knowledge may be useful to the Husbandman.

BOOK VI. PART I.

Of the Parts of Plants, and their Nourishment.

CHAP. I.

Of the Roots of Plants, their Kinds and Forms.

WE are about to explain the Effects of Tillage; and we shall, in order to this, first give some Account of the Parts of Plants, and of the Manner in which they are nourished. Roots, so far as the Husbandman is concerned in their Consideration, may be divided into two Kinds: first, those which spread under the Surface of the Ground, and secondly, those which penetrate strait down: the first of these we shall call spreading Roots, and the other tap Roots, and there will need here no farther Distinction.

The tap Roots plunge perpendicularly into the Earth, the others, according to their Name, disperse themselves every Way, at a small Distance under the Surface.

Those Roots which first shoot from the Seed of a Plant, are always of the perpendicular Kind: they plunge themselves strait down into the Earth, and continue piercing deeper and deeper, till they find it too hard for their proceeding farther. In Places where the Soil is soft and deep, these Roots penetrate much farther down than is imagin'd. They will reach many Yards into the Earth, if uninterrupted and uninjur'd.

When these Roots are hurt or cut, whether by Accident or Design, they change their Nature, and each divides into many others. This is an Observation not easily made in its full Extent, in Plants growing in the Earth, because they cannot be taken up perfect; but Experiments made on such as are rais'd in clear Water, set it in a very strong Light. Such Trials have been made by the FRENCH in great Numbers; they may be repeated and enlarged with Ease; and will not fail to let a great deal of new Light into the Doctrine of Roots.

All tap Roots push out certain Branches, or Fibres, which spread in an horizontal Direction: and these Branches are the more vigorous, the less they are buried in the Earth. The most strong and serviceable therefore spread always near the Surface of the Ground; and within that Depth of the Soil which is mov'd by the Plow and other Instruments of Husbandry.

These are of the Nature of those Roots which we call horizontal. Some Plants have, in this Manner, a main Body which runs strait down, and Fibres growing from it: others consist of these spreading Fibres only, they run often to a very great Distance from the Plant, but in this Case they become so small that they are hardly to be discovered; especially when they

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are of the Colour of the Earth among which they lie, as these very small Fibres commonly are.

A Carrot appears to the incurious Observer to have only one Root, which is long, thick, and perpendicular, with a few short Fibres about it; yet it is found, on a more strict Examination, to spread a great Number of very fine and small Fibres to a great Distance every Way. These are its horizontal Roots, they are of the same Colour with the Earth among which they run, and therefore they are not to be distinguished but by a very strict Examination.

This is the Case with other Plants, as well as the Carrot, and nothing is easier than to be convinc'd of it by an Experiment which Mr. TULL proposes. Let a Piece of new and firm Earth be dug in Form of a long and narrow Triangle. Let the Length of this Piece of Ground be twenty Yards, its Breadth, at the Bottom of the Triangle, twelve Feet, and at the Top let it terminate in a Point. In this Piece of Ground let there be twenty Turnips rais'd from Seed, and let the Ground be kept well hoed. Now when these Roots are grown, if the Turnip that stands first, or in the narrowest Part, at the Top of the Piece, be as large as that which stands at the Bottom, in the Middle of the broadest Part, it will be a Proof that the horizontal Fibres sent out by these Roots, spread very little in search of Nourishment; for they cannot easily go beyond the Part that is dug. If the Turnips be gradually larger and larger from the Top, or narrow Part, to the Bottom, it will shew that a Turnip sends out small Fibres to a great Distance in search of Nourishment, and that it grows in proportion to the Distance they extend. This would shew that a Turnip sends out Fibres, to at least six Foot distance every Way, for there is nothing else to make the last Root bigger than the others; and twelve Foot is there the whole Width of the Ground that is dug. But if the first Root, that is, that which grows in the narrowest Part be small, and those Roots which follow it in a Line to the broader Parts, grow gradually larger till about the Middle, and from thence to the broadest Part, continue much the same in Size and Vigour; then it will be found that a Turnip spreads its Roots three or four Foot every Way, according to the Breadth of the Piece of Ground where they have their full Bigness: and that it sends them no farther.

The Roots do not penetrate, at least not in any considerable Manner, into the hard Ground at the Edges of this Piece, where it has not been dug. This Experiment therefore, supposing this the Event, would shew the great Use of digging, hoeing, or plowing about these Roots, for furnishing them with Nourishment: and it would

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shew, that be the Earth ever so well prepar'd, it is of no Use to them at a greater Distance than three or four Foot every Way; therefore we should see by this, how much Space is useful to be left about a Turnip.

This Experiment may be extended to other Roots as well as Turnips, indeed to all other Plants whatsoever; and it will shew, sufficiently for all useful Purposes, to what Distance they severally spread their Fibres, and how far the Earth is to be cultivated and left vacant for their Service; on this depends the great Advantage of Horsehoeing Husbandry, as will be seen in a succeeding Section.

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CHAP. II.

Of the Extent of the Roots of Trees.

MR. TULL observes, that the Roots of the white Thorn Shrubs in an Hedge, which has a Ditch before it in the usual Way, penetrate below the Bottom of the Ditch, run under it, and rise again on the other Side, to the richer Soil which lies near the Surface, especially if it have been wrought; and then spread horizontally for more Nourishment.

The same Observation has been made by Mr. DU HAMEL, with Respect to a Row of Trees, which seem'd to be kill'd by a deep Ditch that was dug at a little Distance from them, in order to prevent their Roots from spreading into the neighbouring Ground; but these Trees, in a little Time, sent down their Fibres below the Bottom of the Ditch, which, when they had pass'd, they rose again toward the Surface, and spread themselves through the Soil that was wrought, to a great Distance every Way. The Trees had faded at first, upon the digging of the Ditch, but as soon as their new Roots had got into the good Ground, on the other Side, they recover'd.

If a Ditch be dug lengthwise, at a small Distance from a young Tree, and fill'd up with good Earth, the Roots of the Tree will soon get into it, and will follow the Direction of the Ditch, extending themselves in the good Earth that fills it to a great Length.

In the same Manner when Trees are planted too deep in the Earth, they languish till they have sent up their Roots into the upper Part of the Ground, where it is stir'd by Culture; but as soon as they have got there they revive and flourish. The Folly of planting Trees too deep, appears very plainly from this Observation; and when that Fault has been committed, and a Tree is seen to suffer by it, the best Method is to take it up and plant it again shallower.

I have observed that of late Years the young Trees planted about LONDON succeed worse than formerly, a good Part of them dying altogether, and others losing their Tops: upon examining into the Reason, I have generally found it to be the planting them too deep. One would suppose all the Arts should be best understood near the Metropolis, but that of planting is not: this Hint may perhaps be useful.

These and many other Observations which

might be cited, prove that the Roots of Trees spread to a great Distance, when they get into Ground that has been stir'd, and that they will run a great Way, and take strange Courses to find it. The Roots of all Plants, Corn and Grasses, do the same. Leaves are the Organs of Transpiration in Plants, Roots are those destin'd for attracting and drawing the Nourishment. It is evident that, in order to the Growth of a Plant, more Sap must be taken in than is transpir'd; and as all Plants encrease in Growth, it is plain this is done. If we look upon the great Extent of Surface in the Leaves of Vegetables, the Organs of Transpiration, we cannot doubt but that the Fibres of their Roots, which are the Organs of Suction, must be extended in a like Manner. Reason shews that it ought to be so, and late Observations and Experiments shew that it is. It has been asserted that they run out in Length as much as the Leaves expand in Surface, although they are not so obvious to the Eye.

But some Restriction is to be observed in this Assertion. Plants transpire only in the Day: on the contrary, during the Night, they revive and imbibe the Dews and Rains, and what they thus receive contributes greatly to their Growth and Encrease. We are to add also, that there is no Proof that either the Transpiration or Suction in Plants are proportioned to the Surfaces of the Parts; and for ought that is hitherto known, an Inch of Root may imbibe a larger Quantity, than an Inch of Leaf transpires.

But, however this may be, it is certain that the Roots of Plants extend to a great Length, much beyond what has heretofore been imagined.

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CHAP. III.

Of the Manner wherein the Roots of Plants imbibe their Nourishment.

IN the same Manner as the Lacteal Vessels in an Animal have their Openings in the Intestines, for taking in the Chyle, the Roots of Plants have their Openings in their Lacteals, or more properly in their Sap Vessels, on their Surfaces. But there is yet a great Difference, Animals can go about to seek their Food and fill their Stomachs and Intestines, while Plants are obliged to spread their Roots in the Soil, where they stand to imbibe their Nourishment. It is necessary, for this Reason, that their Roots should extend to a considerable Distance, otherwise they would quickly exhaust the Earth that lies just about them.

We may carry this Comparison something farther: we observe that the Pressure of the digested Food against the inner Surface of the Intestines, contributes, together with the peristaltick Motion of those Parts, to the Introduction of the Chyle, or nourishing Juice of Animals, into the Lacteals: and in the same Manner the Efforts which these small Roots of Plants make in extending themselves among the small Particles of fine Earth, the Pressure of the wrought Earth

Earth against the Roots, and the Re-action of the Roots against the Earth, as they encrease in Bigness, and as that closes after the breaking by Culture, answers, in some Degree, to those Motions in the Intestines, arising from their Resistance and their peristaltick Undulation.

To this, which is an Observation of Mr. Du HAMEL, we may add another great Article in the Process of the Roots of Plants obtaining their Nourishment; which is the Effect of Heat. There is Heat in all Things in the Roots which are to receive Nourishment, and in the Earth which is to give it: and this Heat differs in Degree almost every Moment, as is seen by Experiments. Things expand with Heat, and they contract with Cold: therefore they are expanding and contracting, more or less, every Moment. This gives Motion and Pressure between the Roots and the small Particles of Earth continually, and this will much better than any other Means shew the Analogy there is between the Nourishment of Plants and Animals.

This is indeed the true Source of the Nourishment and Growth of Vegetables; and all that has been discovered by Mr. TULL, and those who have followed his Train of Reasons, joins to confirm it. Heat is the Cause of all Motion, and is doubtless the immediate Agent in the Hand of the Creator, for the keeping the whole Frame of Things in Order.

What has been observed of the Action of the Particles of Earth upon the Roots of Plants, shews, in the strongest Light, the Use of stirring and breaking the Ground by Culture, that the Roots may the more easily make their Way through it, and that it may press them as it closes after the breaking.

Whatever be the Reason, Experience shews that Roots of Plants are always in the best Condition for obtaining Nourishment, where the Soil in which they run is light and fine. If two young Trees be pulled up, the one of which has grown in a light, and the other in a heavy and hard Soil, we shall find, on Examination, that the Tree which had grown in the heavy Soil, has but a small Number of Roots, and those large and strong; whereas that which has grown in a light Soil has a vast Multitude of Roots, and all small and fine: and to pursue this Subject farther, let a Tree be rais'd in pure Water alone, where there is no Resistance at all against the spreading of the Roots, and we shall perceive that they are all nothing more than the slenderest Filaments.

The Culture of a Soil therefore plainly occasions the Roots of whatever is sown in it, to be much more numerous, and finer, than they otherwise would have been; and Experience shews also, that it is not from the large and thick Roots, but from these small and fine ones, that Plants receive their principal Nourishment.

It has been said, in a preceeding Chapter, that when a Root is cut it alters its Course and Direction. This is to be explained farther, and it gives the greatest of all Proofs, of the Benefit Plants receive from the digging about them. When a Root of a Plant is cut off, it does not extend any farther immediately, and in its Form, or Course in Length; but it sends out a great

Number of small and fine Fibres. Here are therefore, from the cutting off one Root, a Number of others produced, which are of the proper Kind for drawing Nourishment, and the Ground is at the same Time made ready to receive them, when this is done in digging about the Plant. When the Husbandman digs, or any other way divides the Ground near his Plants, he cuts or breaks off a great many of their Roots: and instead of hurting them by this, we see from every one so broken, there grow a great Number of others more useful than the first.

CHAP. IV.

Of the Importance and Use of the Leaves of Plants.

LEAVES, we have observed already, are in Plants, the Organs of Transpiration, these are so necessary to the greatest Part of Vegetables, that they cannot subsist without them. If we pull off all the Leaves of a flourishing Tree, it will commonly die. This indeed is not always the Consequence of such Loss; for we see Trees sometimes entirely rob'd of their Leaves by the devouring Caterpillars, and they recover: but that is done gradually, and most Trees will die if strip'd at once. The Effect however may depend also on the Circumstance. In some Conditions a Tree may be able to bear the Loss of all its Leaves, and in others not.

GREW has shewn, that the Leaves of a Tree which are to burst forth in Spring, are formed in the Buds the preceding Autumn: they are at that Time very small, but they are proportioned to their Use.

Beside these, which may be called the autumnal Leaves, there is a Reserve in Plants for others: for when Mulberry-trees have been strip'd of their Leaves to feed Silk Worms, in the Beginning of Summer; or when other Trees have been render'd naked by Insects, there grow another Quantity in the Place. This is a Provision of Nature in Favour of Trees and Plants, that they may not always perish by the Loss of so absolutely necessary Parts.

GREW discover'd, in examining the Leaves of Plants, that beside the Network of longitudinal Fibres, which form the Course of the Leaf, there are a Number of Vesicles fill'd with Air. From this Observation many have concluded, that the Leaves were the Lungs of Plants; that they receiv'd the Air from the Atmosphere; that this Air made its Way through the Plant down to its Roots; and that it there produced an Effect upon the Sap receiv'd from the Earth, of the same Kind with that it occasions in the Blood of Animals.

Mr. PAPIN has also published a great Number of Experiments, which seem to favour this Doctrine; he says, That on putting a whole Plant into the Receiver of an Air Pump, it perishes immediately, on exhausting the Air; but that if the Roots alone be immers'd in the Receiver, and the Stalks and Leaves remain in the Air, which may be easily contrived by letting them out, and securing the Opening with Wax, the Plant

Plant will remain alive a long Time. This was proposed by the Author, and has been received by the Publick as a Proof of the Respiration of Plants, and that their Leaves are the Organs.

The many Experiments made by Dr. Woodward, Mr. MARIOTTE, and Dr. HALES, prove abundantly that the Leaves are Organs of Transpiration, and that the greatest Part of the Sap imbibed by the Roots, escapes through them. Indeed if we compare the Quantity of Sap that is taken in by the Roots and other Organs, with the Quantity that is let off by Transpiration, we find that the Remainder is what is left in the Substance of the Plant, and that if there be any other Account in the Sap, it is inconsiderable.

We know also that the Leaves of Plants do imbibe the Moisture of Rains and Dews, and that this is very beneficial to the Growth. This is a plain Use of the Leaves; but we may extend their Benefit a little farther.

It is said that the nutritive Juice receiving a certain Preparation in the Leaves, is thence distributed throughout the whole Plant for its Nourishment: but this supposes the Circulation of the Sap in Plants, which is a Thing not proved by any Experiments: indeed it is a Fact very much to be doubted, not only because it has been advanced without Proof, but because there do not appear to be two Kinds of Vessels in Plants, as Veins and Arteries in Animals; the one of which should carry up the Sap, and the other bring it down again. All that there seems to be in the Motion of the Sap of Plants, is a Kind of tremulous and uncertain Undulation, owing to the different Temperature of the Air.

Those who argue for the Circulation of the Sap, say, That according to the other Doctrine, it must be supposed to be prepared by Degrees as it rises in the Plant; and that there is not any Experiment or Fact to prove, that it is in any greater Degree of Perfection in the upper than in the lower Parts of it. And it must be allowed surprizing, that the Sap received into the Roots of Plants, should be at once so perfectly prepared as to serve all the Purposes of Vegetation, and be able to supply with proper Nourishment the several Parts of the Vegetable. Upon this Plan of Reasoning, and these Objections to the other Doctrine, the Asserters of a Circulation of Sap say, that it is altogether necessary for explaining Vegetation, to allow that it passes through the Leaves, returns thence through the Body of the Plant, and afterwards goes to the Leaves again; as the Blood in Animals returns to the Lungs, after having gone through every Part of the Body. This is a very specious Reasoning, but there wants Experiment to confirm it; and, on the contrary, innumerable Facts stand directly against it.

The Reader sees what is advanced on both Sides, and the Reasons; but he will find the Transpiration of the Leaves all that is proved with Certainty.

Whatsoever be the particular Office of the Leaves of Plants, Experiments sufficiently shew, that they are of Benefit, and even of the greatest Use and Necessity to the whole; this is the Husbandman's material Consideration.

If one cut off half, or two thirds of the Leaves of a young Tree that is full of Sap: we shall find that it will lose its Sap in three or four Days after. The Bark which before would easily separate from the Wood, will then stick firmly to it; and it will be impossible upon the very Day after the Cutting off the Leaves, to perform many of those Operations in Gardening upon it, which might have been done while the Leaves were there. The Difference therefore made by taking away the Leaves only in part, is very evident to the Senses.

A Willow, a Poplar, or any other Tree, but particularly those of the soft Wood Kinds, will grow and flourish for a great many Years, and continue with a sound Trunk, provided it be left to the Course of Nature, and permitted to keep its Head and its Branches; but, on the other hand, when one of these Trees has the Head cut off for shrowding, the Trunk quickly decays and grows hollow. This is most frequently owing to the Wet that gets in at the Parts where the Head at first, or the Shrowds afterwards are cut off; but if ever so much Care be taken in the Shrowding, the Tree does not continue sound as it would have done in its natural State. No Pollard Tree ever continuing firm and good in the Trunk, any proportionable Time to the same Kind of Tree left with its Head and top Branches. The Heads and high Branches of Trees are what carry the great Quantity of the Leaves; it is therefore plain from this Circumstance, that the Leaves of Trees preserve the very Trunk in Soundness.

On the same Principle it is, that the Injuries of the Leaves of Corn affect the Ear. We see as soon as ever they are attacked by any Disorder, the whole Plant declines. This is a Proof like the former, that the Leaves are a Part of the utmost Importance to Plants of all Kinds, and that the healthful State of the whole depends entirely upon them. Not only the whole Plant suffers when they are taken off, but when they are only diseased.

From all this it appears, that the Leaves of Plants, in whatsoever Sense we consider them, are of the utmost Importance to the whole: and as the Leaves are thus important, so are the small Branches that support them. It is for this Reason that Cutting, especially if it be done too close, is certain Destruction to the FRENCH Furze, and many other Shrubs; and to the same Principle is to be referred the vast Damage that is done to the Saintfoine, Lucerne, and Clovers, when they are permitted to be eat down too closely by Cattle; and especially while they are young. The Injury is of the same Nature with that done to Trees by shrowding: they suffer by it extremely while tender, though when their Roots are well formed, and have spread far into the Ground, they recover it.

It is a common Custom among our Husbandmen, to turn in their Sheep upon their Corn Fields, when the young Blade is too rank: we shall in a succeeding Part of this Work, advise some Restrictions and Limitations to this Practice; and they will be founded on this Principle, of the great and necessary Use of the Leaves

to all Plants, and the Injury of cutting, or taking them off.

From these Considerations of the principal Parts of Plants with Respect to their Growth and Nourishment, the judicious Husbandman will naturally be led to the Reasons of those Effects he sees arise from Culture: and understanding what he sees, he will be able rationally to advance farther. We see here that the Roots of Plants differ in their Forms, and we shall find upon farther Examination, that they also differ in their principal Uses. The tap Roots which penetrate deep into the Body of the Ground, serve to keep the Tree or Plant firm in its Place, and those which spread horizontally in the upper Coat of the Earth, that is, the Soil, which is the Seat of Culture, supply it with Nourishment. One Kind therefore may be most needful to one Sort of Plants, and the other to another; though every Plant in some Degree requires, and has the Assistance of both. Nature has given them, according to their several Occasions, the Oak and the Walnut have vast tap Roots to secure them from the Violence of the Winds, which else taking such hold against their spreading Tops, would tear them up out of the Ground; while humbler Plants have the horizontal Roots most considerable, for supplying their useful Products whether in Ear or whatever other Way with Nourishment.

Nature answers different Purposes by the same Means, and often employs these tap Roots to draw Nourishment; for they are common in many Plants which have no great Head, as Saintfoin and Lucerne, and several others that might be instanced; but in the general Course of Things, it is the other Use to which they principally serve. In the same Manner, the spreading Roots which are particularly destined to supply the Plant with Nourishment, assist also, and that very greatly in keeping it in its Place.

With Respect to these spreading Roots, it will be found on Examination, that they grow to the greater Length as they run nearer the Surface of the Ground, because they are there most within the Reach of Rains and Dews, and most under the Influence of the Sun's Rays: they also extend farther and wider in Proportion to the Condition of the Ground, and always run farthest where the Soil is most broken by Culture: for 'tis plain from repeated Experience, that all these Roots run out in Length, and multiply, in Proportion to the Ease with which they make their Way: and they always push themselves with the more Ease, the more the Ground has been broken and rendered soft by Culture.

As to Leaves, we find that they are of the utmost Importance to the Plant; and that on a double Account; as they discharge the Redundance of those Juices that have been taken in by the Root, and as they contribute to its absolute Increase also, by imbibing nourishing Matter from Rains and Dews themselves. These are two very different Offices to be performed by the same Organs, but we plainly perceive that it is thus Nature reciprocally uses them. They discharge the Redundances by Day, and they imbibe Moisture during the Night.

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The Importance of the Leaves to the Plant is shewn abundantly by the Experiments and Facts that have been here mentioned; but whether any one of the Systems that have been proposed be altogether true, at least whether it contain the whole Truth, and explain the whole Use of those Parts, is not yet determined. We have for this Reason delivered them all; that the Reader may see in one short View, what has been advanced for either System by its several Advocates, and may for himself determine by what he shall see in Practice, which is most right; or how far either.

The whole has its Use in the Practice of Husbandry. What has been laid down concerning Roots, is a Matter of immediate Concern in the Cultivation of every Kind of useful Growth whatsoever; and the Knowledge of this Importance of Leaves will be of no less Consequence in the Consideration of many of those particular Vegetables the Cultivation of which will be delivered in our Seventh Book; and which not being so universally the Objects of the Farmer's Care as the common Kinds of Corn, are not so well understood with Respect even to the common Articles of their Management.

CHAP. VI.

Of the Nourishment of Plants.

NOTHING is more difficult than to say, what is the Nature of the nutritive Juice of Plants: no Question has been more debated by Philosophers, and none with less Success. It would be natural to think that this might be discovered by the Nature of the several Substances we use as Manures; but in Respect of these, we see the Effect only: this is very plain and obvious, but nothing is more hidden or difficult to find than the Cause.

We have shewn in our Second Book what are the several Substances used as Manures, and from many of these one would be led to suppose, that the Sap which is so evidently increased and enriched by them, consisted of Salts and Oils, and other Things such as Chymistry is able to extract from these several Ingredients: but then the Effects of many of the more simple Kinds of these Manures, which are often equal to those of the most seemingly powerful, shew that this is not the Case: and we are the more confirmed in this, when we consider that bare Sands will support many Plants; and that many others may be raised in pure Water: and that in either Case they have the same Qualities and Virtues with those of the same Kind raised in Earth, dressed with the richest Manures. This leads one to imagine, that the Sap, or absolute Nourishment of Plants, is in itself a Thing much more simple than it would be natural otherwise to think; and that it obtains all this Variety of Tastes, Smells and Qualities from the Organs of the Plant.

Mr. TULL is of Opinion, that the Nourishment, or as he expresses it, the Food of Plants, is nothing but the Particles of Earth reduced to

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a very fine Powder. Others have had Recourse to Salts as the great Article of the Nourishment of Plants; and many have called in Fire, Air, Water and Earth, to serve the same Purpose; some preferring one and some another, according to the Systems they chose to favour. But this has all been found imaginary, from the Result of frequent Trials; and if we can suppose the Matter of pure Earth capable of being reduced to a State of Solution in Water, or but of being so broken and divided by it, as to be in a Condition to be received into the finest Vessels of Plants, we shall adopt an Opinion much more agreeable to Reason, as well as to the common Course of Things, in supposing Earth itself thus reduced to exceedingly small Particles, to be the very Matter of the Nourishment of every Thing that grows on it.

We find that all Vegetables are finally reduced to Earth by Corruption, and to what should a Thing be reduced by this, but to that Substance of which it originally consisted. Probably the Manures we add for the Melioration of Earth, be they of what Kind they will, serve to no other Purpose but the preparing that Earth for entering these fine Vessels; and the utmost Effect of them may be nothing more than rendering the Earths with which they are mixed, fit for that Purpose.

For Instance, all the rich Manures contain a Salt: now these Salts may have an Effect in dividing the Particles of Earth, and thus preparing them for affording nourishing Plants. Again, Water may soften these Particles thus rendered extremely small, and Air and Fire may put them in Motion. In this Light, Fire, Air and Water may assist in the Growth of Plants, but it is Earth that affords the substantial Part, or Matter of their Nourishment. The Plant may be killed by taking away the Effect of Fire, Air, or Water, but without Earth it could not have its very Substance; perhaps it cannot live without the others; but without this it cannot exist.

The mention of Salts, Fire, Air and Water on this Occasion of the Nourishment of Plants, is unavoidable; because all who have read at all upon the Subject, have been accustomed to hear of them as the Sources of Nourishment jointly or singly; but no Knowledge was ever conveyed upon such Principles. They are necessary to be named because they have Effects on Plants; but nothing is so idle as to suppose that they essentially feed and support them. Water indeed, in the Condition we have it, will do this, but we know Water contains Earth; and it is unquestionably by this Earth that is in the Water, that Plants are nourished which grow in it.

We do not mean by Earth, when we speak of it as the Food and Nourishment of Plants, that simple elementary Substance which the Chymists mean by the same Word, understanding by it Earth divested of all other Principles: on the contrary, we can extract all those Principles from Plants, and we mean no other Thing by Earth on this Occasion, than such as composes a fine Soil, such as it is found on the Surface of Land, and is called Mould.

That this is natural to Plants is evident, because it will not injure them, which all the other Things pretended to afford them Nourishment will. Too much Salt will prevent their Growth, too much Water will kill them, and too much Air and Heat will dry them up; but too large a Quantity of Earth never does them any Harm. Indeed they may be injured by being planted too deep, because their Roots may be buried in such a Manner, as to be out of the Reach of the Air, Rains and Dews, and of the Influence of the Sun's Rays; these being necessary to their Growth, although they do not afford them the real Nourishment.

That absolute Earth is the Nourishment of Plants appears from this, that such as naturally grow in the most distinct and distant Places, are capable of being supported by any Earth indifferently in either. Thyme will not grow in a Bog, because Thyme does not love much wet, but the Earth of the Bog is not in Fault, for that will feed it, if divested of its abundant Water; and removed to another Place. Let a Parcel of the Earth of a Quagmire that bears nothing but Rushes, be dried by the Sun, and placed at the Top of a Hill, and Thyme will grow in it; and in the same Manner let the Earth dug from a Hill be buried in a Quagmire, and when it is well wetted, Rushes will grow in that. 'Tis not therefore the Earth that differs: that is capable to support any Plant: 'tis only altered by the Quantity of Water. The Plants of AMERICA succeed very well in the Earth of ENGLAND, as we see every Day in our Stoves and Green-houses. If they are from a hotter Climate, they must have a proportioned Degree of Heat given by Art, but the Earth does perfectly well. We have argued in this Chapter for Earth being the Food of Plants, and we see in these Instances, that good Earth will support and nourish all Kinds of them; provided they have the necessary Degree of Heat and Moisture: this seems very greatly to support the Opinion.

People of Curiosity tell us, that Water, and even Air, are capable of being fixed and converted into Earth; and some have imagined this of Water particularly, from its so freely seeding of Plants: but that is owing to the Earth it contains, as mentioned already. In fine, if we can as at first said, get over the Difficulty of Earths not being dissoluble in Water, or can suppose that without Solution it is capable of being rendered so fine, that it may enter the finest Vessels of Plants; there appears great Reason on the Side of this Opinion, that Earth of an extreme Fineness is properly and truly the Food or Nourishment of them: understanding by this Term Earth, such as we find it in the Soil.

The succeeding Discourse on Tillage will shew the Necessity we have been under of entering thus far into the present Subject; for otherwise, much of the practical Part would have appeared strange and ill-founded: but whether Earth be in Reality the Nourishment of Plants or not, is to the practical Husbandman no important Matter. If we can upon these Principles lead him to a Method of giving greater Fertility to his Land, we shall not be uneasy upon the Subject

ject of that Uncertainty which reigns, and always will reign in the Enquiries into the Mysteries of Nature: the Explanation of the Nourishment of Plants being one of the greatest.

CHAP. VII.

Of the Reasons there are for supposing the Nourishment of all Plants the same.

IN Consequence of what has been delivered as most probable in the last Chapter concerning the Nourishment of Plants, a Question will naturally arise, Whether we suppose that the different Sorts of Plants take in the same Food, or the same Matter for their Nourishment, whatsoever that be? This is indeed a very difficult Question, but it is very necessary to be considered for the Use of the practical Husbandman: for on the Answer depends his Knowledge how to act in the varying or continuing the same Crops upon the same Piece of Ground.

We imagine that the Nourishment taken in by all Plants is the same, for we suppose that Nourishment to be no other than Earth in very fine Particles carried into their Vessels by Water. But as a great deal of the Husbandman's Practice in his tilled Lands will depend upon the Certainty of this Point, we shall not attempt to force this Opinion upon him; but shall lay before him the Objections that have been made, or may be made by others against it, and propose at the same Time our Answers: when he has the whole before his Eye at once, he will be best able to determine, whether he shall adhere to our Opinion, or to that of others.

Mr. TULL is the Founder of this Opinion, that the Food or Nourishment of Plants, is Earth; and consequently, that all Plants take in the same: the Generality of Writers have adopted a contrary Doctrine: they suppose that every Plant draws from the Earth for its Nourishment certain Juices that are proper for it, and no other, never taking in the Earth itself at all.

On this Principle is founded the Opinion so common among the Generality of Writers, that a Piece of Ground may be exhausted for one Kind of Plant, and not for another; and on this Opinion is supposed to be founded the Custom of the practical Husbandman, of every Year changing his Crops; the Success of which Practice is also urged in Favour of the Opinion. This is a very specious Reasoning.

Barley, say they, exhausts the Ground much more than Oats, when it is to be sown afterwards with Wheat. This is a Fact, and on this they found their Opinion, that the Juices taken for the Nourishment of Barley, are more like those required by Wheat, than are the Juices drawn by Oats.

In the same Manner they add, When a Piece of Ground has been a long Time occupied by one Kind of Tree, if some more of the same Sort be planted in it, they will succeed very poorly; but if Trees of some other Kind be set, there will be Hopes of better Success.

These Facts which we state in their full

Strength, allowing their Truth, seem at first Sight to argue against the nourishing Matter of all Plants being the same: but on the other hand, there are a Multitude of other Observations founded in the same Manner on Facts, to be produced, which stand as fairly for the Opinion we propose, of the Nourishment of all Plants being the same: and these which seem so strong against it may be refuted.

The first is very fairly proposed, and therefore may be distinctly and exactly answered. Barley does exhaust the Ground, on which Wheat is afterwards to be sowed, more than Oats, as is seen by the succeeding Crop. But the Fact is no more than this, that Barley exhausts Ground more than Oats, in general: there is nothing in the supposed Particularity. Wheat requires a great deal of Nourishment, and it therefore succeeds best after Oats, not because the Nourishment drawn by Barley was of the same Nature that Wheat required, or that drawn by Oats different; but because the Barley had drawn in more Nourishment, and therefore had left less in the Ground. The Fact is plain, for we know Barley requires more Nourishment than Oats, for Oats will grow on poorer Land: and this is the whole Matter. The Fact proposed is true, but the Cause mistaken.

The other Objection, if it were stated more particularly, would be as easily answered. Oats requiring little Nourishment, will succeed after Crops that require more; and that when such Crops would not: in the same Manner some Trees require more, and some will thrive with less Nourishment. When one Kind of Tree that requires a great deal of Nourishment has exhausted a Piece of Ground, a fresh Quantity of the same Trees planted on it will not thrive, because the former had exhausted it: nor would any other Kind of Trees succeed, that should require also a great deal of Nourishment. But if a new Kind of Trees be planted there which require less Nourishment, they will succeed, because though there be but little, it may be sufficient for them as they require but little.

A great Part of the Objections which are proposed against useful Discoveries, might be answered by more strict Enquiries in this Manner; they have had their Rise in Error, and they have their appearing Weight only because they are stated imperfectly. To see the whole of the Subject is to be satisfied that they signify nothing.

CHAP. VIII.

Other Objections to the Nourishment of all Plants, being the same answered.

THE first and principal Difficulty they raise who suppose every Plant to draw a peculiar Juice for its Nourishment out of the Earth is, that it does not appear probable the same Matter, and that alike in all Respects, should be able to support and give Increase to such a vast Variety of Plants as we see, and those so different in the most essential Points from one another; in their Forms, Tastes and Virtues.

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This, like the rest, has a specious Appearance: but let it be considered notwithstanding, fairly. There is no Doubt but that the small Particles of Earth which we suppose to be the Nourishment of Vegetables, assume different Forms in different Plants; but this is no Proof that the nourishing Matter may not be altogether the same in the Earth, though altered in their Vessels.

Experience also joins to shew, that the Nourishment is the same for all Plants, from what is seen in their Growth among one another. If a Lettice, for Instance, draws from the Earth a particular Juice for its Nourishment; and that Juice be different from what is drawn by a Plant of Succory, then it will follow that a Lettice set among Succory Plants, must flourish better than when set among other Lettices; nay, it ought in this Case, if the Doctrine of different Juices for every Plant were true, to flourish as well as if no other Plant at all were near it: but let this be tried, and the Result will be quite otherwise. A Lettice planted among Succory will flourish just as much as if it stood among other Lettices; not at all more; and it will not grow nearly so fast, as if no Plant were by it. This shews that the Nourishment of Lettice and Succory are the same, and that Plants of any Kind exhaust the Ground, and rob those which are near them of Nourishment, as much if they be of different Species, as if of the same.

That the Nourishment of Plants, whatsoever it be, undergoes in their Vessels that Change which gives it the particular Taste, Colour, and Form which belong to the Plant, is evident from the common Effects of grafting Trees in Gardening. There is an Instance of Mr. Du HAMEL's, in the Memoirs of the FRENCH Academy, which proves this abundantly, and in a very particular Manner. A young Citron of the Bigness of a Pea, was let in by the Stalk to a Branch of an Orange Tree. The Citron grew to its full Bigness, and became perfectly ripe, it but was to all Intents and Purposes a Citron; having nothing of the Orange at all in its Nature, Form, Taste, or Appearance.

Now if the Nourishment received by the Orange Tree could be thus prepared in the Vessels of the Citron Stalk, and Fruit, what Reason can there be to doubt, but that the same Nourishment taken up from the Earth, may be wrought in every Plant into the Colours, Qualities and Forms that are peculiar to that Plant.

Many contend not only that there is a particular Juice taken out of the Earth by each Plant for its Nourishment, but that every Plant has more Kinds than one. The Pulp of a Peach, the Stone, and the Kernel, they observe are very different Things, and they say there ought to be three different Juices taken up out of the Earth to nourish them.

This is betraying their Cause by saying too much. Doubtless the Organs and Vessels of Plants give the different Taste and Smell to the Sap, as well as occasion its various other Effects in the different Parts. We do not find in the Earth the Taste either of the Pulp, of the Peach, or of its Kernel. There are Soils that

communicate a peculiar Taste to the Fruits that grow upon them, but then this Taste is given equally to all Fruits, and is perfectly different from their own, which each has beside. In this Case the Earth has a Taste, which it communicates universally; but the same Effect is produced beside in the Vessels of the several Trees, and Plants, as in other Places.

In the most strict and accurate Examination of the Roots of Plants, we find no Preparation for receiving particular Juices. GREW shews that the Surface of Roots is a spongy Substance, which must receive all Juices alike; and the Surfaces of all Roots are such. These spongy Openings receive the fine Particles of Earth for Nourishment, and the Organs of the Plant give them their Differences in the different Kinds, as well as in the various Parts of the same.

Plants of the most different Kinds may be raised in Water, and they will all have their particular Forms, Tastes, and Colours. Will these People say that there are in Water different Juices to be taken up by different Plants? that were absurd. We say there are Particles of Earth in all Water, which is a known Fact: and that these are taken up by the Roots of Plants for their Nourishment: that they are in themselves perfectly alike, and are taken up indifferently by all, but that they are changed in the Organs of the Plants, in order to give them their Forms, Tastes, and Colours: this surely is reasonable.

The Advocates for particular Juices affirm farther, that as there is a Necessity for a distinct Juice for nourishing each several Part of the same Plant: it cannot be but that the Roots of every Plant are so formed, that they will receive or admit no Juices but such as are so appropriated to that Plant; and that the several Parts of the Plant afterwards appropriate again such Juice as is alone suitable to them.

No Doubt but according to the System of different Juices, this ought to be the Case; the Question must remain whether it is: and on the Decision of that, the whole Objection may reasonably be said to stand or fall. Mr. TULL has produced an Experiment on this Occasion, the Result of which, as he relates it, is altogether decisive; and destroys that Opinion entirely. The Experiment is this. Set a Stalk of Mint in a Glass of Water: it will grow there and shoot out many Roots. Let some of these Roots be got out of the fresh Water, and plunged into a Glass of Salt Water: in this Case the Mint will presently die, and its Leaves will taste salt.

In this Case there is no Doubt but the Mint is killed by the Effect of the Salt Water upon its Roots; because if the same Roots had been cut off, the Plant would not at all have suffered: and the salt Taste of the decayed Leaves shews plainly, that the Salt was the Cause of its Destruction. This Fact rests upon the Credit of Mr. TULL, who has related it: and he asserts from it very fairly, that it is a Proof that Roots take in indifferently any Nourishment that comes in their Way, even when it is of a Kind that will destroy the particular Plant they are to feed.



C H A P. IX.

Reasons deduced from the Practice of Husbandry.

THE Practice of the Husbandman, and its Success, 'tis said, prove that there are different Juices taken up out of the Earth for the Nourishment of different Plants. Why, say they, are Barley or Oats sown after Wheat, and not Wheat again, if it were not that the Wheat has drawn all the nourishing Juice fit for its Kind, so that the next Crop of the same Species would be starved; whereas there still remains in the same Ground, the nutritive Juice fitted for Barley, and that for Oats, which therefore flourish, though a second Crop of Wheat would not.

It has been answered already, that the real Cause of this is, that Wheat requires and takes up a large Quantity of Nourishment, so that there does not remain a sufficient Stock for a new Crop of it; but that the same Land will raise Oats and Barley because they require less: but to this we shall add here, that if it were true that the Cause of Barley growing well after Wheat, were that the Wheat had left in the Ground the Nourishment proper for Barley; then in Consequence a good Crop of Wheat might be expected after Barley, because the Barley would have left in the same Manner the Juices proper for Wheat, and the Ground would be, in this Respect, the same as if nothing had been sown in it before. But this does not answer in Practice, and we may therefore be sure the Theory is not true. Such a sowing of Wheat would yield a very bad Harvest. The Truth is this, Wheat does not succeed well except the Land have had four Workings: if Barley were sown in Land so prepared, it would succeed greatly, but as it does not bear the Price of Wheat, nor require so much Preparation, they sow it after two.

Barley will grow upon Land that has been impoverished in some Degree by another Grain, therefore it succeeds after Wheat; but Wheat will not thrive unless it have the Land fresh, and thoroughly prepared to give it Nourishment, and it is therefore Wheat will not do after Barley.

If it were true that every Plant drew from the Earth a particular and appropriated Juice for its Nourishment, and no other; what Occasion could there be for that antient Practice of letting the Lands lie fallow one Year in three, as is the Custom in common Fields. If that were the Case, they might instead of this Time of Rest, only give a Change of Crop. Thus if they sowed Wheat the first Year, Barley the next, and Oats the third, and then Pease and Turnips; they might after this last Growth sow Wheat again, the Land having had five Years to recover the Nourishment of Wheat: but this is not found in Fact, nor is there any Truth in the Argument that would support it. The Nourishment of all these Plants is the same, and is no other than Earth in very small Particles,

and there is no other Difference between them, but that one Kind draws more of it than another.

Every one the least acquainted with the Practice of Husbandry knows, that in such a Course as here described, all the Crops would grow worse and worse, till they would not be worth gathering: and this, because all Crops exhaust the Earth of the general Nourishment of Plants, though in a different Degree.

Beside this the Rest is not all that Land has during the Intervals of Crops for its Recruit. It is in this Time turned and worked, by which Means the Particles are anew divided, and there is a fresh Supply of small ones procur'd for the affording Nourishment to the following Growths. The Texture of the Mould is broken so, that it gives free Passage again to the Roots of Corn in new Places; and by all this it is render'd proper for the Production of such Plants as require a great deal of Culture, such as Wheat particularly: and during the whole Time of this Rest and Preparation, it is not suffer'd to be exhausted by useless Plants.

If it were true that every Plant drew from the Earth a particular Juice for its Nourishment, which suited its Purpose, and that of no other Kind, then Thistles, Bluebottles, Corn Marygold, and the other Weeds so frequent among Corn, would do it no Harm; because they would take only such Juices as the Corn would not: but just the contrary is found in Fact. All these Plants do injure the Growth of Corn, and that, because they all exhaust the Earth of its Nourishment, which is the same for one and for the other.

If other Plants did not draw from the Earth the same Nourishment with Corn, then Corn might as well grow among the largest Clusters of them, as singly in a Field: but we find it will not: and 'tis not to be pretended the Stalks of the Plant prevent this any Way, because so many Sticks of dry Wood will do no Harm.



C H A P. X.

The Result of Experiments in Vegetation.

MANY have thought that every Thing that can be dissolved in Water, enters indifferently into Plants; and that each separate Kind, of all these Things, appropriates only what properly belongs to its Nature, and lets the rest all pass off by Transpiration.

This, like many other of these Reasonings, has a very fair Appearance, but it cannot stand before Experiments. We can collect what passes off from Plants by Transpiration: Dr. HALLER has done it, and the Result has altogether contradicted this System. Seeing what great Quantity of Matter perspir'd, says he, I was desirous to try if I could get any of it. I fix'd Glass Retorts to Trees of different Kinds, taking in their Boughs with the Leaves on into the Retort, and stopping up the Mouth about them. By this Means, says he, I got several Ounces of the Matter perspir'd by Vines, Fig Trees, Apple Trees, Cherry Trees, Apricot and Peach Trees, also by Rue, Horseradish,

radish, Rheubarb; and by Parsnips, and Cabbage Leaves. The Liquor of all of them was very clear, nor could I discover any different Taste in the several Kinds: and the specifick Gravity was very nearly the same with that of common Water. Here was a great Variety of Plants and Trees try'd, and if there were different Matters to be transpir'd, these certainly must have shewn that Difference, but upon this fair Experiment there appear'd no such Thing, the Liquor obtain'd from them was in all Respects the same, it was perfectly like common Water, and shew'd no other Difference from it, than that it would stink sooner: this shew'd that it took something from the Plants, but the same from all. Having pass'd through their Vessels it acquir'd some vegetable Quality, but that was the same from any Plant. This Experiment is the seventeenth in Dr. HALE'S vegetable Staticks, it is easily repeated; but the Authority of that Writer is sufficient to establish it; and it overthrows perfectly that System of the Plants taking up several Kinds of Juices, and letting all but the right transpire.

If this were the Case, that each Plant took up all that could be dissolved in Water, and transpired what it did not want, the Ground would be continually exhausted. For what was thus transpired would float in the Air, and be at the Mercy of the Winds, to carry which ever Way they chanc'd to blow.

Thus easily are these Objections to the Earth itself being the Matter of Nourishment to all Plants, answer'd; but there remains a farther Observation to be stated: as this will fall within the Farmer's immediate Notice, and is of much greater seeming Force than any of the former, it ought to be propos'd fairly in this Place, where we are enquiring after Truth for the Service of that useful Art.

The Husbandman will observe, that when his Land which would no longer bear Corn well, has, for some Years, bore Saintfoin or Lucerne, it will again bear great Crops of Wheat. This seems to shew, that the Substance necessary for nourishing Wheat, and that necessary for nourishing of these Grasses is different; and consequently that the Food of all Plants is not the same. And in farther Support of this Argument it may be observed, that Grounds which are laid fallow, to give them Strength for Corn, bear in that State great Quantities of Weeds. This should seem also to shew, that different Juices in the Ground are fit for the Nourishment of different Plants; and that it is not the Substance of the Earth which serves for all. This is what these Observations seem to shew; but let not the industrious Enquirer stop at Appearances, but proceed to a deeper and a fairer Search.

In pursuing this Subject we find, that those Lands which are only left fallow, and have nothing done to them, do not improve either so quickly or so perfectly as they would have done, if they had been well wrought and tilled during that Interval.

We find also, that the greater Part of those Plants which grow upon fallow Lands, are Weeds of slight Roots which spread just under the Surface, and do not penetrate to any Depth; and consequently, that when these Lands are wrought,

and the lower Part of the Soil is turn'd up, this is Land which has lain in absolute Repose. Now the contrary to this happens when Saintfoin and Lucerne are sown, for they root very deep: but for that Reason they do little Prejudice to the Soil near the Surface; for it is found by Experience, that these deep-rooted Plants draw their Nourishment from a great Depth, and leave the superficial Parts of the Earth unexhausted.

Thus when we see the full Extent of this Objection to our System, it ceases to be any Objection at all. In the Case of Weeds on Fallows, they exhaust the Surface only, and that Surface is turned downward in plowing; so that the Earth which is turned up for the Growth of the Corn, is not exhausted by them. It has lain its Year in Repose, and is now fitted for the Nourishment of Corn, by turning and breaking. The Saintfoin and Lucerne root very deep, and draw their Nourishment from the lower Part of the Land; so that a Field cover'd with these Grasses, has the upper Part of its Soil in a State of Repose; and when that comes to be wrought and turn'd up, it is fresh and fit for the Nourishment of Corn, for Corn is the most superficial of all Growths in its rooting. Thus the Case is not that Weeds and Saintfoin draw only a particular Nourishment, and that different from the Food of Corn, that makes Corn succeed after them; but it is that the first exhausts the Surface of the Earth which is turn'd undermost in plowing, and the latter exhausts the Earth at Depths whence it is never turned up for Corn; and all the Time of their Growth, that Part of the Soil in which the Corn afterwards is to grow, lies quiet, they not affecting it.

The Farmer finds by Experience, that Plants with tap Roots do not succeed upon Land where other Plants with the same Kind of Roots have been. Thus Trefoil or Lucerne will not thrive after Saintfoin; whereas those Plants which have spreading Roots, succeed upon the Lands that have born the deep-rooted ones excellently; 'tis plain therefore, that these deep-rooted Plants have exhausted the Earth of its Nourishment at those Depths, but not at the Surface. 'Tis extremely probable therefore, from all Appearances, that the Nourishment, or Food of all Plants, is the same, and that it is nothing but Earth in small Particles. We see that Plants of any Kind exhaust this Nourishment, according to the Depth at which they root; and no otherwise. When this Nourishment is exhausted, the Earth must be prepar'd in order to the giving more; and as it consists only of small Particles of Earth, any thing that breaks and divides the Land answers this Purpose. The Effects of the Air do this in fallowing; the Plow does it in turning and labouring, and the different Manures do it by fermenting the Soil. All these Things produce the same Effect, by several different Ways, and consequently in different Degrees; but of this the Farmer may be sure, whatever will break and divide the Particles of Earth, will make that Earth proper for the Support and Nourishment of Plants.

CHAP. XI.

Of changing of Crops.

HAVING thus explained to the practical Husbandman the Nature of the principal Parts of Plants, and of their Nourishment, he will easily understand the Reasons of all that shall be proposed to him for the Improvement of his Profession: and, where any thing at all out of the common beaten Road was to be proposed, this Explanation was needful.

We see plainly, by the preceeding Observations, that all Plants are nourished by the same Substance; that every Plant will exhaust the Earth of its Nourishment, which would be fit for others of the same Growth; and that a Piece of Land which was once fit for the nourishing and supporting a Crop of any Plant, will continue to support and nourish Crops of that Plant for ever, if it be properly tilled and managed.

This last is an Article of great Consequence, and perhaps little believed by the common practical Farmers, but it is equally true with the others. It is seen to be so by Reason, and may, at any Time, be proved by Experience. Let those who would deny it, first try.

From this we see that it is not necessary to change the Crop every Year, upon the same Land. This plainly makes way for a new Method of Husbandry, and for vast Improvements in that useful Art. It is on these Facts that the Horsehoeing System has its Foundation; and being built upon Truth it must remain for ever.

We do not deny that in following the common Practice of Husbandry, there is a great Advantage in the sowing successively different Species upon the same Land. We have shewn, however, that this is not owing to the commonly supposed Cause, that each exhausts the Earth only of its peculiar Nourishment, leaving the proper Juices for the others; and we shall now explain that Matter farther.

There are three Causes which may occasion this good Effect of changing of Crops, in the common Method of Husbandry; but all of them different from this supposed Cause in the different Nourishment. The first is the different Quantity of Nourishment that is requir'd for different Plants, as has been hinted generally before; a second is the different Constitution and Formation of Parts in each particular Plant, some being much more delicate than others; the third is the different Quantity of Tillage which each Kind of Crop requires should be bestowed upon the Ground. These are the real Causes why a second Crop upon the same Land, should be different from the first, and a third from the second, although the Nourishment of all be the same.

All Plants do not draw from the Earth the same Quantity of Nourishment: this is plain, for there are poor and light Lands which nourish Rye very well, though they would not yield a Crop of Wheat, nor even of Oats. On the other hand, there are Plants which are able to

plunge their Roots into a hard Soil, into which others cannot penetrate. The Roots of Oats will penetrate a hard Land better than the Roots of Barley, and therefore Oats will grow with less Tillage than Barley. This is seen in Experience; for Oats succeed tolerably well in many Places, where the Soil is hard, with only one dressing: Whereas Lands that are much lighter and softer, require two Dressings, in order to produce a good Crop of Barley.

From this Observation we may conclude, that in following the common Practice of Husbandry, some other Corn should be sown for the next Crop after Wheat; because Wheat requiring several Dressings of the Land, in order to yield a good Crop; and requiring also to be sown in the Beginning of Winter, or soon after Harvest, it would be impossible to give the Land those necessary Dressings for it, without which we know, from Experience, it will not succeed. Here is a plain Reason for the changing the Crop in the common Method of Husbandry, without having Recourse to that idle and false Cause of the different Nourishment requir'd for different Plants. For with Respect to Oats and Barley, as they are not to be sown till the following Spring, there is Time between the gathering the Wheat Harvest, and the Season of sowing them, to give the Land the one or two Dressings which they severally require; though it would be impossible, in the short Time between the reaping of Wheat, and the sowing it for the next Crop, to give the Land the four Dressings needful for that Corn.

The Years Fallow that is given to prepare for Wheat, gives perfect Opportunity for those four Dressings, and for all the Advantages which the Land receives from the Air and Rains, between one of them and the other.

If any one should take a Resolution of always raising Wheat upon the same Land, he must sow it only every other Year. The Year between must be a Year of Fallow, for the giving the Land its four Dressings; and in this Manner the same Land would for ever yield large Crops of Wheat, without ever sowing any other Corn.

Mr. TULL produces an Instance which sufficiently shews that Wheat will not, in any Condition, succeed upon Land that has not receiv'd its proper Number of Dressings. He says, That on sowing a Piece of excellent Land with Wheat, in the usual Way, it grew so thick and heavy that it lodg'd, and little Grain was got at Harvest: after this the Owner seeing the Richness of his Land, thought that it would bear Wheat any Way, and giving it only one Dressing, sowed Wheat again, expecting, that as the Growth would be now less strong, he should have a better Harvest; but he was disappointed, he hardly obtain'd from it the Quantity of his Seed Corn.

Wheat is found to succeed very well after Turnips; and People from this have fancied, that the Nourishment of Turnips was different from that of Wheat, and that they did not exhaust the Earth at all of what should serve that Corn: but he who has consider'd what we have already said of Wheat, will see this is owing to a very different Cause. The great Requisite for Wheats

succeeding is, that the Ground be very well dress'd by Tillage. The Turnips are sown on Ground that has been very well work'd; and it is dress'd over again as they are growing: therefore, when the Wheat comes to be sown afterwards, it has a Land different from what it commonly is allow'd, but different in the right Manner, for it is more labour'd and dress'd than in the customary Way.

Farther it may be observ'd, that Turnips exhaust Land very little, unless they be suffer'd to run to Seed. Nor is this all: we find that the Nourishment the Turnip does exhaust, is little more than Water, so that less of the earthy Matter going into them, the more is left afterwards for the Wheat. This Fact may be prov'd by Experiment on the Roots themselves. If a large Quantity of Turnips be mix'd with Wheat Flower, and made into Bread, when the Bread after baking comes to be weigh'd, there will be found very little more of it than if the same Quantity of Flour had been used without any Turnips.

From this it appears, that if Turnips are sown upon a Land intended for Wheat, and eaten off before they run to Seed, the Land is only better prepar'd for that Corn by their Growth, not being in any considerable Degree exhausted of its nourishing Particles; and at the same Time the Cattle eating these Turnips upon the Spot where they grow, their Dung and Urine add greatly to the Richness of the Ground.

When Saintfoine has grown upon a Piece of Ground, there must be proper Care in the introducing Wheat upon it. This Ground not having been dress'd or turn'd for nine or ten Years, while the Saintfoine was upon it, will not be sufficiently broken by one or two Dressings, for the nourishing a good Crop of Wheat. One or two Dressings after this Grass will prepare the Ground very well for Oats: but more are altogether necessary for the Success of Wheat.

Upon these Principles we shall find, that although in the ordinary Way of Husbandry, it is impossible to have Wheat every Year upon the same Piece of Ground, with any Degree of Success; yet in the Method of Horschoeing Husbandry, it may be done. All that we have been here premising, is for the Explanation and Recommendation of that Practice of the Farmer; from the which, managed with Prudence, according to the Directions we shall lay down, he may, in most Cases, make a much greater Advantage of his Land than in the common Methods. By this Practice a Crop of Wheat may be advantageously rais'd every Year upon the same Ground, and the Means upon which this will depend are, to give it more Dressings; in order to break and divide the Particles of the Earth more perfectly; to put the Plants in a Condition to spread their Roots in this prepar'd Earth in the most advantageous Manner, for the obtaining the Nourishment wherewith it abounds; to prevent Weeds from robbing the Crop of its Nourishment thus afforded by the Ground; and to be careful not to raise upon the Land more Plants than can be subsisted well upon it. These are the Principles on which the Practice known by the Name of Horschoeing Husbandry depends,

and every one must see, that these are founded on Reason, and on what is seen in the Growth of Plants in every Way in which they are rais'd. This has the sure Ground of Experience, and therefore cannot fail.

CHAP. XII.

Of the Distribution of the Nourishment of Plants in the Earth.

WE have shewn the great Advantage of a Year of Fallow is, that it gives Time for a sufficient Number of Dressings, for the Destruction of Weeds, and preparing the Land for Corn. These Dressings must be at proper Intervals, for otherwise they have not half their Effect. Between one Dressing and another, the Weeds that are plowed in should have Time to rot, and the Earth new turned up to receive the Benefits of Sun and Rain. A second Dressing coming immediately after the first, would only throw up the same Land again, undoing what the first had done in a great Measure.

From what has been said on this Subject, the considerate Reader will understand not only the Necessity of Dressings for Land, but the Nature of their Benefit: and in pursuing this we shall naturally fall upon the Subject of the present Chapter, which is the Distribution of that Nourishment we have described in the Earth.

However good a Soil may be in its Nature, the Plants sown in it can have very little Advantage from its Richness, if their Roots cannot spread and penetrate it to get at the Nourishment. A Soil that is too firm will not permit this, its Riches are as if they were lock'd up; and it must be broken by Dressings. The vast Fertility of Garden Ground is owing in a great Measure to this continual stirring and breaking of it in digging; and we see in the same Manner that all Earth is fruitful that is frequently mov'd and broken. We may therefore safely establish it as a Principle, That the more the small Particles of a Soil are divided, the more its inward Pores are multiplied, and it is in Proportion render'd the more fit for the Nourishment of Plants. We have said already how great Things may be done for the Improvement of Land by Manures, we now come to the Article of Dressings, for on the proper Understanding of these two Things depends all the Knowledge of Husbandry. The common Practice rests most upon Manures; the Horschoeing Husbandry on Dressings of the Land by Labour and Tillage: this is their great Difference.

The Nourishment of Plants, we see by Experience, is spread throughout every Part of the Earth, but it would there answer no Purpose to us if Plants were not able to draw it, and take it in for their Supply. To this Purpose it is necessary, that they have the Means of spreading the small Fibres of their Roots between the several little Particles of Earth in a Soil. Land in which these Particles are pressed too close, or conveeted too firmly together, prevents

vents this Passage of the Roots; but it appears altogether necessary that there be Spaces between these Particles into which those Roots may run. Most Soils have naturally these inward Pores, but frequently they either are in too small Quantity, or they are not of proper Kinds and Proportions for the admitting and supplying the Roots. This is the natural Defect of Soils, and this is to be remedied by Dressings.

When the Pores are in too small Number, it frequently is found that there is no Communication between one of them and another; and by this Means the Roots are stop'd in their Passage, and cannot get at the Nourishment that is ready for them in other Places, nor obtain enough for the Support of the Plant. This is the Fault of too stiff Soils.

On the other hand when the Pores are too large, the Roots go through them almost without touching the Earth, they therefore can take no Nourishment from it: this is the Fault of too light Soils.

These are the Defects of the Generality of Soils, and these may be remedied by Culture properly conducted: for the Earth contains so great a Quantity of Nourishment, that there is no Need to fear exhausting it; the only Business is to put the Roots into a Condition of getting at it.

Neither are we to fear that this Nourishment, intended for Plants, will be scattered and lost of itself: Experience shews that there is no such Danger. If we dry a Piece of Earth ever so thoroughly, and then powder it ever so fine; if we expose it in this State ever so much or so long to the Sun, Rains, and Frosts, it will not have its nourishing Particles dissipated or lost by this; but all that Management will render it more and more fertile. This is a Proof that the Nourishment it affords is real Earth, Water is necessary to be mix'd with those Particles of Earth, which are the Nourishment of Plants; and in the common Course of Things, when this has carry'd up the nourishing Particles into their Vessels, it is transpir'd through their Leaves, leaving those Particles behind. This is the Course of Nature in the supplying of Plants: but when Water is

evaporated from the Earth, without passing with it into the Vessels of Plants, it goes off alone, taking with it none of those nourishing Particles. This is plain from what we have before observed, that Lands which are left fallow grow more rich and fertile; whereas, were the Water that is evaporated from them to carry the nourishing Particles of the Earth along with it, they would be rendered poorer by this Practice.

In the Management of Land for giving it Fertility, what we are to aim at, is not so much to provide or supply Plants with such Particles as are needful for their Nourishment, as to dispose them in such Manner that the Plants can gather those Particles they possess, with their Roots. Almost all Soils contain of themselves the Nourishment of Plants in Abundance, what the Husbandman is to do is, to put them into a State fit to afford it to their Wants.

The great Article in bringing this about, is a proper dividing and breaking of the Particles of the Earth; this must be done in such a Manner, that those Particles may leave between them as great a Number as possible of little Spaces, into which the Roots may insinuate themselves, in such a Manner, that immediately touching the Particles of Earth, they may gather from them those extremely fine and minute Parts, which are their real and proper Nourishment or Food.

This breaking and dividing of the Soil is to be done, as already said, two Ways, by Manures and by Tillage: we shall, in the succeeding Chapters, examine impartially and strictly by which of those Means it may be best obtain'd; for on that depends the Merit of one or the other Kind of Husbandry; and it is by understanding their different Operations alone, that the practical Farmer can be directed in his Choice, which Method to prefer on any particular Occasion; and how to manage his Ground to the greatest Advantage. This it is the immediate Purpose of our Work to inform him; and we shall therefore give a fair and candid Representation of every reasonable Method that has been propos'd for this Purpose.

BOOK VI. PART II.

Of the Advantages of TILLAGE.

CHAPTER XIII.

Of the several Methods of dividing the Particles of Earth.

WE have shewn, in the preceding Chapters, that the Means of giving Fertility to a Soil, consists in the dividing and breaking of its Particles. We are now to examine in what Manner that Effect may be best produced; and we shall do this with Impartiality. The favouring a particular System may mislead Men, but they are safe from Prejudice who have no Aim but the Discovery of Truth.

Numb. XXIV.

There is, beside the two Ways already mentioned of dividing the Particles of Soil, which are Tillage and Manures, another to be remembered here, which is Heat, or the Effect of Fire. The Difference is this, Tillage operates mechanically, breaking those Particles merely by the Instruments employ'd in it; Fire acts in the Way of Calcination; and Manures by Way of Fermentation.

Dung, which is the principal amongst Manures, always alters in some Degree the Nature of the Productions; and there is beside another Disadvantage in this Respect, which is, that we cannot

procure it always in the needful Quantity. On the other hand, it is always in our Power to increase the Tillage as much as we please, and this never alters the Quality of the Productions; Dung and other Manures may give some Substance to the Earth; but repeated Dressings by Tillage expose one after another, the different Parts of the Ground to the Influences of the Sun, Air and Rains, and these render it in a surprizing Manner fit for the affording Nourishment to Plants.

It has been shewn already, that the more we break the Particles of the Earth, the more we increase the Number of its inward Pores; the more we increase the Surface of those Particles, the more we put the Soil in a Condition to furnish Plants with Nourishment: that is, the more we add to its Fertility.

We see it is in our Power to effect this by Fermentation raised by Means of Manures, or by the Instruments of Tillage; and that the Use of Dung is limited, because the Quantity is limited; but the Method by Tillage is without Limitation, because we may give as much as we please.

That Dung has the ill Effect of spoiling the Taste of the Products of the Earth in some Degree, is proved by its Effect in Kitchen Gardens. The eatable Plants raised with Dung being much worse tasted than those without. The Cabbages and Pulse are never so well flavoured in great Towns, where they are raised with Abundance of Dung, as they are in the Country where Dung is scarce, and less of it is used in rearing them. And in the Wine Countries this Effect is the most obvious of all, the Difference being surprizingly great between Wine made from the Produce of a Vine that has been dunged, and that from the Grapes of the same Kind where there has been none of that Manure used.

These are the real and certain Disadvantages of Dung, especially when used in too great a Quantity: Mr. TULL has carried this Point much farther. He attempts to prove that Dung gives hurtful Qualities to the Plants raised by its Assistance: but the Fondness for his System carried him in this a little too far; and it must be observed, that his Arguments are not conclusive.

It is probable, on the contrary, that a poisonous Plant would have less Power when raised in a rich dunged Soil, than in the poorest natural Earth; for we find Dung, though it increases the Growth of Plants, weakens their Qualities, and even their Tastes.

Dung acting by Fermentation makes an inward Division of the Particles of the Earth, which must needs be useful in giving it Fertility; but the Instruments of Tillage break those Particles, and at the same Time do something more; they change their Place, they turn about the larger Parts of the Soil, and give them all the Advantage of the Seasons, at the same Time they destroy Weeds. The Improvement therefore which is made by Tillage has many Advantages, whereas that made by Dung has but one. The Earth thus dressed is not exhausted by useless Plants; and it receives from Time to Time, and in all its Parts successively, the Advantages of the

Dews, Rains and Sun, all which we see, from manifold Experience, assist greatly in giving Fertility to Land.

A great Disadvantage attending the Use of Dung is, that it draws Insects together which eat the Produce. When Trees are planted in a dunged Ground, it is always found that their Roots suffer by Insects; and the curious in Flowers have for the same Reason banished the Use of this Manure from their Practice.

A very good Method to remedy this Evil, where Dung is found proper to be used, is to mix Lime with it in the making up the Heap. Let a Layer of quick Lime be first laid for a Foundation to the Heap of Dung, and then as the Dunghil rises by the Addition of fresh Quantities, let there be here and there a Layer of Lime spread between. This will not only destroy those mischievous Insects which the Dung frequently brings with it, but it will also kill in great Part those Seeds of Weeds which are one Way or other received among the Dung, and produce them too often in Abundance among the Corn.

It is represented as a great Advantage of Dung, that it is equally useful on all Kinds of Soils, the light and the heavy: and there are very few Exceptions to this; but the same is to be said in favour of Tillage: for it equally agrees with the stiff and the loose Soils, and improves and gives Fertility to them all.

Stiff Soils have their Particles so close to one another, that the Roots of Plants cannot make their Way, or penetrate them sufficiently; and it is well known that when the Roots cannot penetrate and spread in the Earth, the Plant languishes. Now when these Lands have been broken and divided by Tillage, and their Particles thus separated from one another, so that the Roots find Passage among them, and can spread as they ought to seek Nourishment, they will be able to supply the Plants with Food; and we shall see the Crop grow upon them with Strength and Vigour.

This is the Advantage of Tillage on stiff Soils; and it has an equal good Effect on such as are too light and loose, though in a contrary Way. The Fault of these light Soils is, that they have too large Spaces between their Particles, and that many of these have not a Communication with one another, so that the Roots passing through these large Cavities, do not reach their Sides; and, consequently, not touching those small Particles of Earth which are the proper Nourishment of Plants, they cannot take them in, and of course cannot draw Nourishment for the Plant. Now the Effect of Tillage on these Soils is this; it breaks the Particles of Earth as in the other, and by that Means multiplies Spaces between the Particles, making a great many small ones instead of a few large ones. This it is obvious to Reason must be the Effect of breaking and dividing a light Soil that has large Intervals; and this naturally qualifies it for affording Nourishment to Plants: for these small Spaces have their Communications between one another, tho' the larger, from the Nature of the Soil, had not, so that the Roots of Plants can penetrate into them, and run thro' them

them as they should; and at the same Time touching their Sides every where because of their Smallness, they are able to take in those extreamly minute Parts of Earth which we have shewn to be the proper Nourishment of all Plants.

We have observed, that in order to the Roots of Plants receiving or drawing in their Nourishment, there must necessarily be a kind of Pressure or Resistance between those Roots and the small Particles of Earth among which they run. This naturally happens when the Spaces between those Particles are small, though it could not when they were so large as they naturally are in light Soils.

C H A P. XIV.

Of the Degrees of Tillage, and of the Use of Dung.

WE have observed in a former Chapter, speaking of Dung, that Mr. TULL has endeavoured to prove it useless on all Occasions, as well as hurtful on many; and that he is for banishing it from the Practice of Husbandry.

We there observed, that the Fondness for his System carried him too far on this Article, and we shall here shew that he was not so far censured without Reason.

The Origin of the Horsehoeing Husbandry we have observed, is laid in that Passage recorded by Mr. EVELYN, where it is asserted that nothing more is necessary than the thoroughly breaking and dividing the Particles of Earth, in order to make it capable of nourishing any Plant: from which it appears that nothing more is useful to the giving Fertility to a Soil, than the dividing of its Parts, and breaking the little Lumps into which they form themselves. This is very true with Respect to many Kinds of Soil, but it will not hold good of all: and from this we shall shew the practical Husbandman, that there is Danger in his adhering to any System or Method too strictly; for that although the Benefit of Tillage, in the Manner it is proposed in the Horsehoeing Husbandry, may be, and certainly is greater than that of Dung on many Soils, it is not on all. The judicious Farmer in order to make the most of every Part of his Land, should be acquainted with every useful Method of managing it; but when he knows them all, he should prefer that Kind to each Part which is suited to its Nature. 'Tis the informing him in this particular Manner, that is the Intent of the present Work: we have laid before him the old Method by Manures, we are here about to propose to him the new Husbandry, which places a particular Kind of Tillage in their Stead; and that he may be able to employ that Knowledge, we shall endeavour to convey to him on this Head to the best Purpose; we shall shew him, that neither is absolutely preferable to the other, so as to render it entirely useless; but that one Kind of Management may do for one Land, and another for another: we shall shew him where Manures will be preferable to the breaking of the Ground by

this Method of Tillage, and where this Tillage may be preferable to the common Way by Manures; and shall give him some Directions also with Respect to this Tillage; as we already have regarding Manures: shewing in what Degree the one, as in what Quantity the other, may be useful and necessary to particular and different Soils.

Mr. EVELYN has said, that the breaking and dividing a Quantity of Earth, and exposing it for a Time to the Weather, will render it so fertile, that it will support any Plant. On this rests the Foundation of Horsehoeing Husbandry, which proposes to render a Soil fertile by breaking and dividing it with Tillage. But Mr. DU HAMEL declares, that the Fact is not universally true, and therefore disputes the Practice founded on it in some Points, while he allows it its Merit in others. He says the Assertion is not true of all Kinds of Earth, for that he tried it on Clay, and found it did not succeed. He powdered a Quantity of Clay, and sifted it thro' a fine Sieve; but after this, wetting it with Water, it became as tough and stiff as it had been originally. This is the Objection stated by Mr. DU HAMEL, and though not so conclusive as he seems to intend it should be imagined, it has its Weight.

In the first Place, he has not on this Foundation a Right to question Mr. EVELYN's Fact, for he did not fairly try the Experiment. He says he powdered and sifted the Clay, but he does not tell us he exposed it to the Weather. This is a Part of Mr. EVELYN's Process, and he says it should be so exposed a Year. We have seen in the preceding Part of this Work, that the Effect of Fire in a proper Degree of Calcination, renders Clay fertile. We have observed also on other Occasions, that the Sun and Air have in these Respects the Effect of Fire, only that it is brought about more gradually. Now in this Case the powdering of the Clay would have rendered it more fit to receive the Influences of the Sun and Air, and the continual stirring and turning of it, which is directed in the Process, would have exposed every Part of it at Times to their Effect; so that it is not easy to say how much the Process fairly tried would have done toward the rendering even Clay fertile.

However, although the Experiment be stated imperfectly, and does not infer so much as Mr. DU HAMEL intends; yet this may be properly seen from it, that clayey Soils will not be so readily improved by this Tillage as the loamy and lighter Kinds; and that other Methods may be needful to be practised upon them. Thus the Tillage of the Horsehoeing Husbandry alone, will be sufficient for light loamy Soils; and on the other hand, the Farmer who has such as are stiff and clayey, will do well to call in to its Assistance the Effects of Sand, and the other proper Manures; and when that appears necessary, of Calcination.

It is in this prudent and moderate Way we shall recommend the Horsehoeing Husbandry to the practical Farmer: and it is thus, and thus only, he should admit the Use of any new Methods. Their Authors or Inventors are always partial

partial in their Favour; but that may be very beneficial on many Occasions, which is not adapted to all.

It is certain that clayey Soils are apt to grow stiff again, after ever so much Tillage; as has been observed in its Place, unless assisted by proper Manures; yet we are not for that Reason to say, that for clayey Soils, Manures are better than much Tillage, for none require so much as these. Both are required for these Lands: a great deal of Tillage to break them, and then good and proper Additions to keep them in Order. 'Tis thus that from very indifferent they become some of the best Soils we have; and it is thus the Farmer is to manage them. Here therefore neither the old Husbandry is better than the new, nor the new better than the old, but the true Practice is to join them.

Manures are necessary to Clays to keep them in a good Condition, after they have been divided by the Tillage; and they are necessary to light Soils because they want Matter of Nourishment. They enrich these and divide the other: they are necessary to both, and they will take double Effect on both, when they are accompanied with good Dressings.



C H A P. XV.

Of the joint Advantages of Manure and Tillage.

TH E S E are the Advantages of Manures, the World has been sensible of them at all Times, and it is the Farmer's Interest always to continue the Use of them, not to neglect them for any other Practice: but this does not make the Horsehoeing Husbandry, which was meant to set them aside, at all the less useful. Where Manures cannot be had in due Quantity, this Tillage will, on most Soils, supply the Place of them; and where they are ever so plentiful, it will be a Means of giving them much greater Effect. The Use of Manures need not make the Farmer less regard his Tillage; for the more the Ground is broken and divided by that Means, the more Effect they will take.

Wheat that is the strongest Corn, and requires the most Tillage of the Land, succeeds yet better when even more is given than usual; and it is found by Experience, that this may supply the Place of Manure. Four Dressings are commonly given Land for this Corn, and the Use of Dung is added: if the Farmer will give it eight Dressings instead of four, it will succeed as well in most Soils without Dung. These additional Dressings cost much less than Manures, and when they succeed, the Effect is equal. They will at any Time in part, and on many Occasions entirely serve instead of Manure, therefore it will be certainly to the Interest of the Farmer to use them.

Upon these Principles it is easy to see, that there may be Improvements made in the common Practice of Husbandry. Tillage in the common Way does not answer the Farmer's Purpose for stiff clayey Soils. It breaks the

Soil in this Case only into a Kind of large Lumps, which have large and irregular Cavities between them; and we have shewn from the Nature of Plants, and their Manner of obtaining Nourishment, that such a Soil is not in a Condition to support them well. From this it appears, that for the Farmer to use these Lands to the best Advantage, he ought to give them more than the common Tillage; and that by the repeated Dressings in the Horsehoeing Husbandry, he is to break those larger into smaller Lumps. By this Means a stiff Soil will be brought into the Condition of a light one; and will be perfectly fitted for the Nourishment of Plants, or the raising a good Crop: Manures are at that Time to be added, and they will be received into the Body of the Soil better than they otherwise could; and there will then require nothing more than a Repetition of that Practice which brought the Land into this good Condition, to maintain it in the same for ever.

We have shewn that Sand is a good Manure for Clay: this proves the Advantage of Tillage on such Lands, for Sand answers the same Purpose in a Manner with Tillage. It breaks the Soil, and lets in the Sun and Rains, and gives Passage to the Roots of the Crop. This is just what Tillage does, it furnishes no nourishing Matter to the Soil, it only separates the Particles of the Earth; or keeps them separate when they have been broken by Tillage, and this produces all the good Effects we desire.

Light Soils are improved by Dressings, but they need not to be so frequent as on the others. To these Manures are wanted to give Richness, as to the others, to divide and keep the Soil divided: but we need not be afraid of exhausting the Fertility of these Lands, by exposing them to the Sun: this has been answered already, for the Sun evaporates only their watery Parts, not that solid Substance which is to be the Nourishment of Plants. It is certain that all these Lands are improved by Dressings, and those not in small Number; whether it be that this happens from the breaking of their Particles, making them more ready and fit to receive the Dews and Rains, and to receive the Influence of the Sun and Air, or whether from the multiplying their inward Cavities, as Mr. TULL imagines, so that they are fitter for the spreading of Roots; from which ever Cause it rises, the Effect is certain: and one great good farther attending it is, that by these repeated Turnings, Weeds are destroyed entirely; whereas light Soils are those which in the common Methods of Husbandry produce them most of all, and that in greater Abundance, from the Use of Dung and other rich Manures.

What is here said of the Advantage of turning light Soils, and breaking them by repeated Dressings, may be proved by way of Experiment. Let one half of a Piece of Land that has this Soil, be dressed in the common Way, and the other be perfectly broken and divided by the Method of Tillage used in the Horsehoeing Husbandry: after some Time let the whole Field be turned again in a dry Season, and that crossways, so that the Land may be cut exactly in the opposite Direction to what it was

at first: in this Case we shall perceive by the Eye the Advantage of this thorough Manner of Dressing, for that half of the Field which had been perfectly tilled before, will have quite a different Aspect, from that which was but carelessly gone over in the usual Way: and we shall see plainly, that the one has had the proper Advantage of Dressings, and the others not. We may find the same Proof at any Time in the Difference of the Crops on such light Land as has been well laboured, and such as has not, but here it is obvious even to the Eye.

Many have a Custom of breaking the Particles of a Soil with Rollers. This does not deserve the Name of breaking in Comparison of what is done in the proper Way by Tillage, but it has its Advantage. When the Land is not too moist, it is a very good Method of preparing it for Tilling; but in wet or very damp Lands, the Rollers does more harm than good. Some also suppose that they can supply the Place of the proper Tillage by frequent harrowing of their Lands after they are sowed; but this scratching of the Surface of the Ground at best can do little Good; and when the Ground is wet it will do a great deal of Harm.



C H A P. XVI.

Of the Preparation of Wood Lands for Corn.

WHEN a Piece of Ground has not been sown for a great many Years, and is to be prepared for Corn, they call it a new Land: this requires a particular Manner of Dressing, and that is to be varied according to the Condition in which they have been before, some being heathy, others having lain in Wood, some in Pasture, and others in artificial Grasses. These require severally their particular Methods of Dressing; and there are others whose natural Humidity makes them demand a Method different from all. These last we have considered before: we shall treat of the others separately, and begin with the Method of preparing a Piece of Land for Corn, that has been covered with Wood.

In the Beginnings of Agriculture, those who set about it had much more of this Business upon their Hands, than we at present; a very natural Condition of an uncultivated Country, is to be over run with Wood; and in such a Case many found whole Countries who first set about their Improvement. In this Case it was not worth while to sell the Timber, for they would have had no Market for it; so they set Fire to it upon the Spot, and the Ashes, assisted by the Action of the Heat, were of great Service in the Improvement of the Ground: after this they had no more to do than to stub up; make all level, and go to sowing.

At present Wood is so valuable, that it is to be treated in another Manner. When a Piece of this Land is to be turned into a Corn Field, the Trees are felled, the Roots are stubbed up, and this is such an Advantage to the Land, that it will answer in some Degree the Effect of the burn-

ing, and of the Ashes in the other Instance: and a little Trouble does afterwards.

We have said in a preceeding Part of this Work, treating of Coppice Wood, that it is a very good Preparation of Land for Corn. It may be often worth while to plant Coppices with this very Intent: but whether that be done, or the Coppice or larger Wood be felled for this Purpose, there is no Land that answers more happily for Corn, or with less Trouble.

The Holes that are made in taking up the Roots, and the rest of the necessary digging, turn up and break the Land in an excellent Manner, so that half the Labour of Dressing is saved.

In this Case, after the Earth has been levelled, there is no Occasion for more Tillage than this, it is to be turned up once in Autumn with the Plow, the Frosts of the succeeding Winter kill the Weeds, and break the Particles of the Soil; and after this no more is needful than a second Dressing of the Ground in Spring, and the Land may be sown, and will yield a vast Produce.

This Land that has lain in Wood is not only very fertile at first, but it continues so a long Time. The Trees have drawn their Nourishment from great Depths, so that the upper Part of the Ground has lain in a Manner unexhausted, and the Shade of the Boughs has prevented Weeds from growing in any great Quantity. Beside this, the Leaves falling every Year, and lying upon the Earth till they rotted, have been for many Years a continual Manure of the richest Kind upon the Ground: and the decayed Branches have added to the Fertility, for the same Reason.

Thus we are to look upon a Piece of Land that has been some Years in Wood, as if it had been in a Manner laid fallow all that Time; and the Consequence proves, that we are not disappointed in the Expectation from it. A good Piece of Land that has been some Time in Wood, will produce vast Crops of Corn for many Years, without the Assistance of the least Article of Manure; dressing it but moderately by the Tillage of the Horsehoeing Husbandry; and that which was originally of little or no Value, and would not have produced Corn to any Advantage, with the most expensive Manures, when it has lain some Years in Wood, answers beyond Expectation. There are Trees of one Kind or other that will grow on all Kinds of Ground; and there is a certain and very great Advantage from them: this has been shewn already. We see the Consequences of that Growth in the Improvement of the Soil, and this consider'd together, may be sufficient to lead many who have Lands which they know not how to bring to any Value, to try them this Way. While we recommend this Method, we illustrate by the Example, the Practice of Horsehoeing Husbandry, and shew the Truth of those Principles on which we have before said it is founded. We have said that the Roots of Plants seek their Nourishment near the Surface; and that Trees penetrate for it deeper: this is proved by the Readiness of a Soil on which Trees have long grown, to yield great Crops of Corn: and we see in the Practice by which it is prepared for

for this Growth, the great and certain Advantage there is in breaking and dividing the Ground: for all that stubbing and digging that is needful in taking up the Roots, serves in the Place of so much Manure to the Land. The Spade and Pick-axe break the Lumps and divide the Soil, just as well as the common Instruments recommended in the new Husbandry; and the Effect is the same; for the Land is made fit for the bearing of Corn. Let the Particles be broke and divided, and the Purpose is always answer'd: it is no Matter by what Means that is done; so it be done the Effect is certain.

CHAP. XVII.

Of the Preparation of heathy Land for Corn.

UNDER the Denomination of heathy Land, we here mean every kind of waste and useless Ground, that produces Weeds of the worst Sorts, and is very barren of what is good; such as Tracts of Ground over-run with Heath, Broom, Brambles, Fern, and the like: these are the Lands of which we treat in this Chapter, with respect to the preparing them for bearing Corn.

It is always proper to burn these useless Productions upon the Spot, as we have shewn already under the Article of Burnbaiting. This is serviceable, not only because the Heat improves the Ground by a Kind of Calcination, and the Cinders serve as a Sort of Manure, but the immediate Effect of the Fire upon the Roots, is a great Benefit, nothing so perfectly destroying them; nor any other Practice so thoroughly ridding the Ground of the Fear of their after-shooting. As the Seeds are consumed, as well as the Roots perfectly destroyed, by this Practice, there is great Reason to believe they will never rise again, and this is of the utmost Concern, because they are dreadful Enemies to all useful Growths.

We have, in another Place, cautioned the Farmer to take Care, that in burning his Stubble upon the Land, he does not fire his Hedges; but a greater Caution is needful here. In firing the Growth of these waste Commons, the Quantity is so great, that it is a Body of Flame capable of spreading to do vast Mischief. The first Care therefore must be to know, before the Fire is lighted, where it will stop, for it may spread much farther than ever was intended or thought of.

When a heathy Piece of Ground is to be thus fir'd, the best Method is to clear away a good Space where it is intended to stop, by cutting up the Furze and the like; and this will stay the Progress, though nothing else can. At the same Time the Stuff that is cut up, being dried, will serve to begin the Fire, spreading it at the other End of the Ground.

A tolerably calm Season should be chosen for setting about this, and the Fire watch'd as it burns. If it any where at the Sides threatens to exceed its Limits, the Method is to dig instantly a little Ditch, throwing the Earth upon the Fire.

This will preserve the rest; for Earth is a much more sudden and certain Quencher of Fire than Water.

When the Stuff is thus burn'd, the Roots of the Furze and Heath are to be dug up with a Pick-axe, and such others as are firm enough to stop or impede the Plow. The Land is then fit for the common Practices of Husbandry.

The best Season for burning the Bushes is Autumn, and as soon as some Rains have fallen, the Ground is to be turn'd up in large Furrows, by a stout Plow, it is then to lie till Spring; and then, after another plowing, it should be sown with Oats; the second Year it is to have three good Dressings, turning, cutting, and breaking it well every Time; and the third it will be in a Condition to bear Wheat, without any Addition of Manure.

The single Article of Labour, after the first Assistance of burning, does the whole Business, but this Labour must be well perform'd, and sufficiently repeated; for as the Fertility, in this Case, depends principally on the breaking the Lumps, they must be well broken, and nothing but this thorough Tillage can prevent the old Inhabitants from taking Possession again of the Ground. Notwithstanding they have seem'd so perfectly destroy'd, they will, after several Years, recover, to the Destruction of all useful Growths, if they be not kept down by this Tillage: but this, if properly attended to, will never fail. The Winter turning exposes the Roots to the Frost, which nips them, and the Summer turnings spread them before the Sun, that burns them up. In general, it is one vast Advantage of this Kind of Husbandry, that no other whatsoever so perfectly destroys Weeds of all Sorts, and that in all Lands; the annual as well as perennial: those that rise in Numbers from every Years Seeds, and those that remain from Year to Year by their Roots.

CHAP. XVIII.

Of the Preparation of Land for Corn, after the artificial Grasses.

WE have observed that it may be often proper to prepare an indifferent Land for Corn, by planting it with Coppice Wood: the same Advantage that it receives from this Plantation, it may also have from the artificial Grasses that root deep; and from none so much as Saintfoin, which penetrates very far into the Ground, and draws very little of its Nourishment from near the Surface. We have observed that the planting a Piece of Ground with Coppice, is a Kind of fallowing of the Land, with respect to the upper Part, or that which is concern'd in the feeding of Corn; and the same is the Case with these deep-rooted Plants.

Many have been surpris'd to see these, and the Saintfoin in particular, grow successfully upon these stony Grounds, which have but a very thin Coat of Soil; but this is no Argument against its rooting deep, and thence drawing its Nourishment: on the contrary, this Instance, when well understood, is the greatest Proof that can be brought

brought of the Truth that this Grass draws its Nourishment deep, and that it does not exhaust the Land near the Surface, which is the Seat of Nourishment for Corn.

When there is this stony Bottom to a thin Soil, it is usually loose, flaty, or crack'd toward the upper Part, or where it rises to the Bottom of the Mould: and these Cracks and Openings are found, on Examination, to contain Mould of the same Kind with that above. The Saintfoin that is sown in this Soil, sends its Roots into these Cracks and Crevices, and runs among them to a great Depth. From the Earth that is lodg'd in these it obtains its Nourishment, and scarce draws any from the thin Coat of pure Ground above.

These Sorts of Land, when kept constantly in Tillage, succeed very ill, because the Quantity of Soil is so small; for the Roots of Corn never penetrate among the Stones: but the raising Saintfoin on them, serves as a Kind of fallowing for them. After this Herb has grown seven Years on them, which it will very well do, they will yield there good Crops of Corn, and may then be laid down to Saintfoin again very advantageously.

These deep-rooted Grasses are of the same Benefit to all Soils, that they are to this light and stony Kind; some may want the Assistance more than others, but they are useful on all: and after their own great Crops, they prepare the Land for Corn better than almost any other Method.

If a Piece of rich Land be drill'd with Saintfoin, six Gallons of Seed being allowed to an Acre, and sow'd in nine Inch Rows, it may be mowed annually with very great Crops; a single Crop sometimes yielding four Pounds an Acre: and after it has stood thus seven Years, the Land may be plowed up, and will be so rich, that instead of requiring to be fallowed or dung'd for Wheat, the Farmer will be obliged to sow that upon Barley Stubble, and to turn in his Sheep in Spring upon it, to prevent its being too rank.

This, which is a Fact proved by many Instances, may serve as a Proof of the vast Advantage of preparing Lands for Corn by these artificial Grasses; for the Saintfoin will be not only in full Perfection these seven Years, but would be able to stand much longer; and no fallowing would have prepared the Ground for Corn like it.

The best Method for preparing the Land for Corn after this Growth is, by first sowing it with Turnips; and I would have my young Husbandman go through it in this Manner. Let him plow it up in Winter with a four-coulter'd Plough, and get it in order for the sowing of Turnips for the following Season. When the Turnips rais'd upon it are in Growth, let them be well hoed; and let them be eaten by Sheep, upon the Ground. This will bring the Soil into excellent Order for Barley, in the following Spring.

The Farmer will often find it answer his Purpose, to raise Saintfoin upon a Piece of Ground for a Continuance. In this Case, when it grows old he must take it up, and sow Corn to prepare it again. The Method we have here directed is the best he can possibly follow for that Purpose;

and when he sows his Barley it may be done by drilling, and the Saintfoin with it.

The same Preparation does when the Land is intended for Corn for a longer Time. In this Case let the Husbandman take Care that the Ground be very well tilled, for otherwise the first Crops will be very poor. Saintfoin prepares Land excellently for Corn, but there must be good Tillage at the breaking of it up, or else the Advantage will not be perceived. There have been Examples of those who have omitted this Care, and they have found the Want of it. Even Oats will not grow upon it to any Profit, without this good Tillage. Some have sown a broken-up Saintfoin Ground with white Oats, upon once plowing: but if the Summer prove a dry one there will be no Crop at all, and if the Season favour ever so much it will be a very poor one.

From these Instances, which through the Backwardness of the Farmers to receive proper Advice, have too often happened, some have been led to dispute whether these artificial Grasses do, in reality, enrich Land or not; but those who will not follow proper Measures, when they are pointed out to them, are not to deny the Effects that would have ensued if they had: those who have taken the proper Care in the succeeding Tillage, have always found that these Grasses left the Land fit for any Produce. This is so plain in Fact, that it has been us'd against the System of Earth being the Nourishment of all Plants, and the same to all.

It has been said, because Saintfoin leaves the Land rich for Wheat, therefore Saintfoin draws a Nourishment different from that of Wheat, leaving what would have been drawn by Wheat all there: but this has been already shewn to be an Error.

Some have ventur'd to say, that this deep-rooted Grass spreads no Roots or Fibres in the upper Surface of the Earth: and therefore leaves it unexhausted: this is one great Reason, but they carry it too far, who say this Grass sends out no Fibres into the upper Part at all.

It is true that Saintfoin roots very deep. It has a single long and large Root which penetrates, counting the extreamest Fibres at least fifteen Foot deep into the Ground, and it doubtless draws a great Part of its Nourishment from these Depths. The Plant does send out Roots into the upper Soil, but that is a small Part of the Ground among which it spreads, and only a proportional Share of its Nourishment is derived thence; so that the Case being fairly stated, this Soil enjoys a Kind of Fallow, because it affords but a fifteenth Part of the Nourishment to the Growth that is upon it. This is the true State of the Case, and they wrong a good Cause who would make it otherwise.

We allow therefore that these Grasses do draw some Nourishment from the Soil in which Corn is to grow, but this is but in small Quantity, and it is over-balanced by another Consideration, which is the second Crop, or After-Grass, being eaten by Cattle upon the Ground. There is a great deal in this: so much, that upon the whole there is Reason, as well as Experience, to shew that a Piece of Ground planted with these artificial Grasses,

Grasses, and properly managed in the spending of them, and in the Tillage afterwards, is left in as good a State by this Growth, as if it had been in Fallow. It must not be objected to this, that the lower Parts of the Earth are not so fertile as the upper; so that the Roots of these Grasses cannot draw such Nourishment from them as from the others; we have allowed for that in the Computation, for we are not to reckon the Soil at a Foot deep; and though this lower Earth is not so rich as the upper Part, yet being fresh, and never exhausted of what it had, it will supply a great deal to the first that come there: the Roots of Corn never pierce to it, so that the Roots of these Grasses are the first that come, and they will therefore have Nourishment.

C H A P. XIX.

Of the Preparation of Land for Corn, after common Grass.

COMMON Grass has not the Advantage of those artificial Kinds last described, in preparing Land for Corn, because its Roots do not pierce to any Depth for their Nourishment, but spread in a vast Quantity near the Surface, in such Manner that it should seem they would exhaust Land more than any other Growth: but this does not prevent the Ground from being very ready to bear Corn, and even to bear it in Abundance, provided it be good in its own Nature.

There is one Reason why Pasture Ground retains a Richness, that is ready to support and nourish any Crop, which has been named in its Place, and needs only be refer'd to here; that is, that in plowed Lands, especially such as lie upon a Descent, the Rains wash away a great Part of the fine Mould; whereas all is retain'd in those cover'd with Sward, and whatsoever is brought on by Accident with it; as the Wash from higher Grounds, the Mud from the Over-flowing of Rivers, and the like.

For these Reasons a tolerably good Pasture Ground is always ready for Corn, when any one chuses to convert it to that Use.

The proper Season for doing this is in the Month of JANUARY; and the Farmer should take an Opportunity to do it after Rains, for when the Land is well wetted, the Turf is tough, and it will hold to turn without breaking, which is an Article of great Advantage in the plowing it.

A very experienced Plowman should be employed on this Occasion, for no Part of that Business requires so much Skill and Nicety; and the Eye of the Master should be over him, to see that he lay the 'Turf' he turns up flat and true. If this be done in an artful Manner, one can hardly see where the Plow pass'd, and this is the Proof that it is done perfectly.

But beside a good Workman there should be a good Plow on this Occasion; for without that no Art in the Man will make the Work go on well. If the Earth Board do not turn it well, a Piece of Wood is to be nail'd on it, to take the upper Part of the Turf as it rises; this will ne-

ver miss to throw it over with the Grass Side downward; and the Master should look on till he see that it be so prepar'd, that this Purpose is fully answer'd.

The Advantage of this is the rotting of the grassy Part, which decaying, becomes a Kind of Manure, as has been shewn already; every vegetable Substance, in a State of Decay, being an enriching Article added to the Earth. But this is only the first Step toward the preparing the Land for Corn. That is to be completed by repeated Plowings, and the more of these it has, proper Intervals being allowed between one and the other, the better it will be fitted for the Growth of Corn.

This breaking of the Ground by the Plow, or whatever other Instrument, is properly what we mean by Tillage; and these repeated Plowings are called Dressings of the Land. Many use the same Word to express the laying on of Manures; and in that Case also, in Concurrence with the common Custom, we have us'd it in that Part of our Work which treats of that Head; here it means only the turning or breaking of the Ground.

Every Time the Earth is thus turn'd, the Particles of which it consists are broken in a greater or smaller Number; the more of them the better: and it is on this Principle that the plowing of Lands that have fed a large Sward of Grass, prepares them for Corn.

We have shewn that the Nourishment of all Vegetables is fine Earth, which they imbibe from the Surfaces of the little Particles among which their Roots spread and run. When these Roots have taken up all the fine and small Mould that lay about the Surfaces of those Particles where they spread, then the Soil is said to be exhausted. It may be renewed by the Addition of Manures, which ferment and divide its Parts, or by the Action of the Plow which breaks them; either Way they are broken, and consequently new Surfaces are made among them. These have new earthy Particles upon them, ready to be absorbed by the Roots of a new Crop, and therefore a new Crop thrives, being sown upon that Land.

This is the Doctrine of exhausting and refreshing of Land; and it is of the breaking it by the Plow we speak in this Place. This is done in some Degree by every plowing, but most perfectly by the best, and by the most frequently repeated. A slight plowing moves and divides the Particles of Earth, without breaking many of them; but still this is of Service, for where they are separated one from another, though not broken, there is a new Surface at the Division of them, and this answers some Purpose, though 'tis not so much as will be done by better plowing.

We have said, that in the preparing a common Pasture for Corn, there must be careful and good plowing; the Reason is this, the Ground has lain a great while untouch'd or undisturbed, and the Surfaces of its Particles have been well drain'd of their Nourishment by the Growth of the Grass. These Surfaces could not yield Nourishment for Corn; but when the Ground is well turn'd and divided, the Particles are broken, new Surfaces are

are formed, which the Grass being destroyed, does not exhaust; in this Condition the Corn finds it only improved by the Effect of the rotted Grass, which serves as a Kind of Manure. Therefore in this single Act of breaking up the Ground of a Pasture for Corn, provided it be well done, there is the Advantage of entirely new Particles, and new Surfaces in great Abundance; and of Manure. This agrees with our Plan perfectly, which is not to prefer one Method before another, but to use both.

If any one wonder that the same Land shall continue to be refreshed by Tillage after repeated Crops, as supposing that this turning and breaking of the Particles, when repeated so often, must come to no more than the turning up the old Surfaces again; he errs in the Principle, for the Earth is divisible without End, and no Art could bring about what he supposes happens by Accident: the same Surfaces never can appear again in a Thousand Plowings, because the Particles of the Earth form every Time new Combinations; and every new Surface answers like the first: all supply Nourishment equally; and every Time the Earth is turned up and broken well, it is like fresh Earth.

Let not the Husbandman who has a Piece of Grass Ground to plow for Corn, question whether the Soil be fit for that Purpose, for every Soil that will bear tolerable Grass, will also support Corn. Nor on this or any other Occasion, let him suppose the Kind of it disables him from having Recourse to this Assistance of Tillage, for we have shewn that it agrees with both; and Experience shews, that on light Lands two or three additional Plowings will answer the same Purpose as dunging of it; and the Cost is not more than a fifth Part of the other. This is so plain from the Experiments that have been made, that it is getting into Practice in some Places, and has obtained the Name of double Plowing.

It has been found, that if a Field prepared for Barley in Spring, be not sowed with that Grain, but plowed on to Wheat Harvest, the Crop of Wheat will be surprizing; and in the same Manner when Crops of Turnips fail one after another by the Fly, the Ground thus frequently plowed, bears Wheat to a Miracle without Dung.

People that are very slow to take Advice, will be led by Experience, and this is the most plain imaginable. From this Effect of thorough Tillage without Manure, it is extremely evident that there will require no Assistance to the Plow in preparing Grass Land for Corn, only let the Plow not be spared. The Work sets out with a natural Manure, and it will be a great while before the Land, if properly tilled, requires any other: but when it is seen to require any, let not the Fondness for a Plowing System deny the Use of it: the Benefit arising from the Use of the four coultered Plow on these Occasions, we shall shew hereafter in its Place. As much as we here say in Favour of Plowing often, we have before said of Manures, and the Farmer should carry both in his Mind together; and use the one to the Assistance of the other, when required, that he may take every Advantage for the making

the most of his Ground without damaging it for the Owner.

CHAP. XX.

Of keeping Land in Heart by Tillage.

THE Farmer will observe that we do not recommend to him to depend upon Tillage only, for the keeping his Land in Condition to bear Corn, tho' that has been proposed as possible, and is supported by Experience. Plowing and breaking the Ground will do this, but the Assistance of Manures will make it answer the better. And sometimes one Method, and sometimes the other are to be used, according to the Circumstances, as shall be directed under the proper Heads.

Having thus premised our Advice to have Recourse to other Methods as well as this, we shall now tell him what may be done by this Method alone.

As new broken Earth is the same Thing with fresh Earth, to all Intents and Purposes, provided it be sufficiently broken, there is no Question but Tillage will supply the Place of Manure; for it will always break the Soil: light Soils, as before observed, when well broken by Tillage, become closer and heavier, because it brings their Parts nearer together; and heavy or stiff Land is made lighter by it, because the breaking and dividing of this, naturally renders it less tough, that Fault being nothing but the too great Cohesion of those Particles. But in order to obtain this Advantage for either Soil, the Tillage must be sufficient: for otherwise, stiff Lands half tilled, have large Cavities, which is the very Fault of too light Soils; and, in the same Manner, an imperfect Tillage of a light Soil leaves it rough, and very much of the same Nature with the half tilled stiff Land: both being in this Condition, full of large Pores and Cavities, which we have shewn are not proper for the nourishing of Plants.

We mean by this to shew the practical Husbandman, who shall in any Respect depend on Tillage for the Improvement of his Land, the Necessity of sufficient Tillage, otherwise he will deceive himself; and perhaps blame that Practice which he has not followed.

The common Kind of light Land, supposing it to have been in Grass, as in the last Chapter, becomes a great deal lighter for an imperfect Tillage; the Pieces of Turf that remain turned under and not broken, make large Hollows, and increase its Lightness, and render it in all Respects worse than it was before the Tillage. But when the Farmer has such a Piece of Ground, and finds he has hurt it instead of improving it by this Method, let him not be disheartened, but go on; let him till it more till all these Pieces of Turf are broken, and it is altogether fine, and he will then find it answer very fully to his Expectations. This Kind of Land has a great Advantage over the stiffer Sorts, because it is to be tilled with less Labour and Expence, working easily: and it answers excellently, for it becomes stronger than at first, and is often more profit-

profitable to the Farmer than Land of a better Kind, that requires more laborious Tillage.

It is observed, that in very light Soils Crops suffer extremely in dry Seasons; and especially after Rains have fallen for some Months, as is sometimes the Case; and these very dry Seasons succeed. But this Accident happens to them only in Proportion as they have been imperfectly tilled; and when the due Care is taken, not at all.

The Fault of light Lands is the having large Cavities; these, when the Ground is wetted by long Rains, are full of Water, and that Water touching the Roots in every Part, supplies the Plant with Nourishment; but when the dry Weather follows, and they become empty, the Roots do not touch their Surfaces, and cannot be nourished, so they fade and decline. But good and perfect Tillage prevents the Earth from having these large Cavities, and therefore it remedies this Evil. In these, and in all others, the Way to bring them to good, is by beginning with deep, thorough, and good Plowings; and the Way to keep them in Heart is to repeat the same Practice.

The Effect of frequent Tillage is to make the Pores or Cavities between the Particles of Earth where the Roots spread, numerous and small; they cannot be too numerous, or too small, and therefore the more Tillage is given, the better; for the more there is given, the smaller and the more numerous they will be: these Pores cannot be too small, when made by Tillage, because the rest of the Earth being light and loose, the Roots of the tenderest and finest Kinds will make their Way in them; whereas in a natural or untilled Earth, they may easily be too small, and often are so, because the Earth all about them is hard. This is the Advantage a tilled Ground has over the best natural Soil.

In order to the keeping a Piece of Ground in Heart by Tillage alone, we have said that should be done frequently and well: but these are Words at large, and convey little direct Instruction, unless explained. Nothing is so common in Books that teach a Science, as to say what is to be done, without telling the Reader how to do it. This is a Fault we hope we have hitherto avoided, and shall endeavour to avoid throughout.

The first Plowing in the usual Way answers very little Purpose, nor does the second do much more good. These two first, if done with common Plows, and in the common Manner, cannot so properly be said to be Tillage, as to prepare the Land for Tillage: the third and fourth Plowings are done at much less Expence than these two first, and they are of much greater Benefit to the Land: every Plowing that is given after these, does more and more Service, and comes at less and less Expence. This is sufficient, one would think, to recommend them to the Farmer; and their Effect is certain. We see that nothing prepares Land for Wheat in the common Way but frequent Plowings: and when they come thus easy, why will not the Farmer give more of them to his Wheat Land, that his Crop may thrive the better; and give them also in proper Quantity to his Lands that

are prepared for any other Seed, as they will be sure to return the Labour with ten-fold Increase.

When a Land has been put into a good Condition by Manure, nothing assists the Effect of that Addition so much as good Tillage; a Piece of Ground prepared in the common Way with Dung, will be exhausted in three Years, according to the common Methods; let it have double Tillage, which is an Expence nothing near the Price of a new dunging, and it will keep in Heart six Years; and with more, longer.

In short, there is no Way of managing Land to the best Advantage, but by the Use of both. Manure should be called in when a Land has been long kept in Heart only by Tillage; and Tillage, in this increased Degree, should be called in to preserve and continue the Effects of Manure. Nothing is so idle as the proposing one against the other: there is no Reason the Farmer should not use both, for they never interfere with one another. We hope we have shewn him so far the Nature of Soils, the Virtues of Manures, and now last of all the Benefits of repeated Tillage, that he will be able to call in one or other alone, or both conjointly, as he shall find most likely to be beneficial.

This is certain as to the keeping a Land in Heart by Tillage, that it is only to be done by allowing it a sufficient Quantity of Labour: the more it is allowed the better, there being proper Intervals of Rest between; and this is certain, that a Piece of Ground may be thus not only kept in Heart, but made stronger and better; for the finer Land is made by Tillage, the richer it will become, and the more Plants it will support, and the better it will maintain them; that is, the better and larger will be the Crop.

CHAP. XXI.

Of the Nature of the Improvement by Tillage.

THE finer an Earth is made by Tillage, the more it is enriched by the common Advantages of Dews, Rain and Air. These penetrate into every Part of a fine well tilled Piece of Ground, so that when it comes to be turned again, and fresh broken, all the new Surfaces that are formed by breaking the Particles, are rich and full of Nourishment; this is not the Case in tough and hard Lands, for the Dews and Rains do not penetrate them: and this shews the Advantage of continued and repeated Tillage.

In very dry and light Lands, the Instruments of Husbandry cannot take Effect in breaking or dividing them, for their Particles give Way to the Plow without breaking, and at the utmost are only turned. The Author of the Horsehoeing Husbandry is aware of this; and he declares, such Lands do not deserve the Name of Arable, but should be reputed Desert, scarce deserving the Name of Land, like the Deserts of Libya, except by way of distinguishing them from Sea.

This

This is a specious Way of talking; and were there no other Husbandry in the World but the Horsehoeing Kind, it would be true; and the Farmer who happened to have such Ground in his Hands, must leave it uncultivated. But this may shew the Insufficiency of that Author's Scheme of making the Horsehoeing Husbandry universal, even from his own Confession.

We have shewn how such Land, as he says ought not to be called Arable, and indeed is not capable of being brought to any Use upon his Plan, may by another Method of Husbandry be improved so as to yield large Crops; and we may tell his Admirers, that by such Management as has been directed for barren sandy Lands in the preceeding Parts of his Book, the very Deserts of LIBYA might be made to yield excellent Crops of Corn.

So easy an Addition as Clay to a sandy Ground, reduces it to Loam, and Loam is fertile; and Furzes may be raised for a Fence. In such an Inclosure so made, and so manured, Corn will grow, therefore this new Scheme is not universal: it will assist the old Methods of Husbandry, but it will not supply their Place, and it is thus we recommend it to the Farmer: not as his only Practice, but as one that he should understand as well as the others; one that deserves to be used much more than it is; and that will often be of vast Service.

We see in this last Instance, that the Land cannot be brought into Heart by Tillage alone, even upon his own Confession; this Sort of Land then must be brought into a Condition upon the Principles of the old Husbandry; that is, by Clay, and the proper Manures, but it may be kept in Heart by Tillage.

In this Case the Method proposed by Mr. TULL, has great Advantages attending it, tho' it will not succeed alone. This Land will be better kept in Heart by the new Tillage he proposes, than by the old, because the new is the more perfect. The Soil is made less fine in common Tillage, therefore the Advantage will be less; but in the Tillage he proposes it will be more fine, and consequently, the Effect will be greater.

We cannot see a greater Instance of the Effect of Husbandry any Way, than by the Observation of such a Piece of Land as this. The Farmer upon the Principles of the old Husbandry, adds Clay to it, and by this Means converting it into Loam, he may be said to make a Soil. When he has thus made it, it is in the Condition of one that is better by Nature, and it is now fitted for the new Improvement by a more perfect Tillage. It could not receive the Advantage of that Method according to the Confession of its Author in its natural State; but it may in this improved Condition. We see therefore how useful it is to the Farmer to know every Practice, and not to stick to any one, but to employ them all as there may be Occasion. 'Tis thus we propose them to him for his general Use. He sees in this Instance he may make a Soil by the old Methods, and he may keep it in Heart by the new; so that the one shall continue to him those Advantages he received from the other.

The two great Articles in providing that Plants shall have Nourishment, are, that the Roots may spread freely to their full Extent; and may every where have the due Pressure in the Ground. These are effected excellently by Tillage in a compleat Way, for the Earth is made fine and soft: it lets them in any where, and it closes every where about them. All the Earth is full of Nourishment for Plants, and their Roots are thus put into a Condition to search for it, and receive it. If they could not spread by reason of the Hardness of the Ground, they must be content with what is supplied by the Earth just about them; and if they spread ever so freely, and pass where there is ever so much Nourishment, they cannot get it unless they come to touch the Surfaces whereon it lies; and this they cannot do in half-tilled Ground, because the Cavities are there so large, that the small Roots pass through them without touching their Sides. We repeat this upon the present Instance, that the Farmer may perfectly understand it, and remember it; for this is the Principle on which he is to act in the new Method of Tillage.

Let him be sure therefore never to spare Tillage; the Land being poor is no Argument against his employing it: for the poorer the Land the easier it is wrought; so that there is less Expence in the Tillage; and if the Crop be not equal to that upon better Land, neither is the Rent.

The great Mistake of our Farmers, is their not giving their Land sufficient breaking; and in this they err very unhappily, for they go thro' the laborious and expensive Part, which is that of the first Plowings; and they then leave off just when the Remainder is most wanted, and would be most easy as well as most advantageous.

They suppose the Soil to be fine enough when the Harrow will cover the Seed; as if the Covering of that were the only Use of the Fineness of Land. To give the Crop a due Benefit from the Land, every Lump of it should be broke; for though the Seed may be buried among these, and covered in an irregular Manner, yet the Roots which shoot from it will never be able to penetrate those Lumps, and they are of no Service to its Vegetation; whereas if the Tillage had been continued till these Lumps were broken, every Particle of the Soil would have been made useful; and the Crop would have had the Advantage of double, treble, or sometimes much more Land in the same Field.

The Harrow is an Instrument that often misleads the Farmer greatly to his Hurt. He supposes he can tear the Soil to Pieces with it; whereas, on the contrary, the Horses that draw it frequently do much more Harm by their treading, than the Harrow does good. Let him never depend upon this Instrument for breaking the Ground; let him use it sparingly and cautiously, and then it will be of Service; but much better Things than that will become hurtful upon improper Management.

The Roller may be mentioned as another Implement that often does Harm, though it may do a great deal of Good when properly used.

The

The Season is all in all on this Head. The Business of Tillage we see is to break the Land, and divide its Parts; and this may be assisted by the Roller, if used at a proper Season, or otherwise it may be impaired by it. If the Roller be used in wet Weather, it presses down and closes the Soil instead of raising and opening it: but if used only in dry Seasons, it breaks the Lumps, and does a great deal of Good.

We shall speak of this more largely hereafter, but it was necessary to name it here where we are treating of the keeping the Ground in Heart by Tillage. If the Harrow be used first to tear up the Clods, then the Roller to break them, and the Ground be afterwards plowed again, and all this in dry Weather, no Kind of Tillage answers better, nor more tends to render the Earth fit for the succeeding Crop.



B O O K VI. P A R T III.

Of the Instruments of Husbandry, and their several Uses.



C H A P. XXII.

Of Plowing.

WE have explained in the preceeding Parts of this our Sixth Book, the Principles on which the Tillage of Land are founded, and the Means on which the Success of that Treatment will depend. This may be called the Theory of Tillage; from which we now come to the Practice: nor would that Theory have been allowed so much Room in this Work, but that the Practice depends for its Success entirely on the understanding it: and nothing is of so much Importance to the Farmer.

The Knowledge required for the Management of Grass Grounds is comprized in a small Compass, as will be shewn in its Place; and the Expence and the Hazard are both little. On the other hand, the Management of Arable Land is the Height of his Business. It requires the most Knowledge, and it demands the most Expence; therefore he is to endeavour by all Means to make himself a Master of it. The Profits arising from this Branch of his Profession, if rightly managed, are much greater than from any other; but if he set about it ignorantly, the Loss will be great also, and his Ruin may be the Consequence.

All that has been hitherto said is but preparatory to this Article; let him therefore apply the Knowledge he has acquired already, to the understanding this, and to the conducting himself in his Work according to that Understanding.

All Soils are not to be wrought in one Manner; if they were, the Knowledge of Husbandry would be easy. But as each Kind has its particular and appropriated Manures, as has been seen already, so each Kind requires also its particular and appropriated Manner of Tillage. Plowing is the great or capital Operation of Husbandry; and according to these Differences of Soils, and the particular Treatment they require, there have been invented different Sorts of Plows, which are severally used according to the Nature of the Ground in different Places, and which shall be described in the succeeding Chapters.

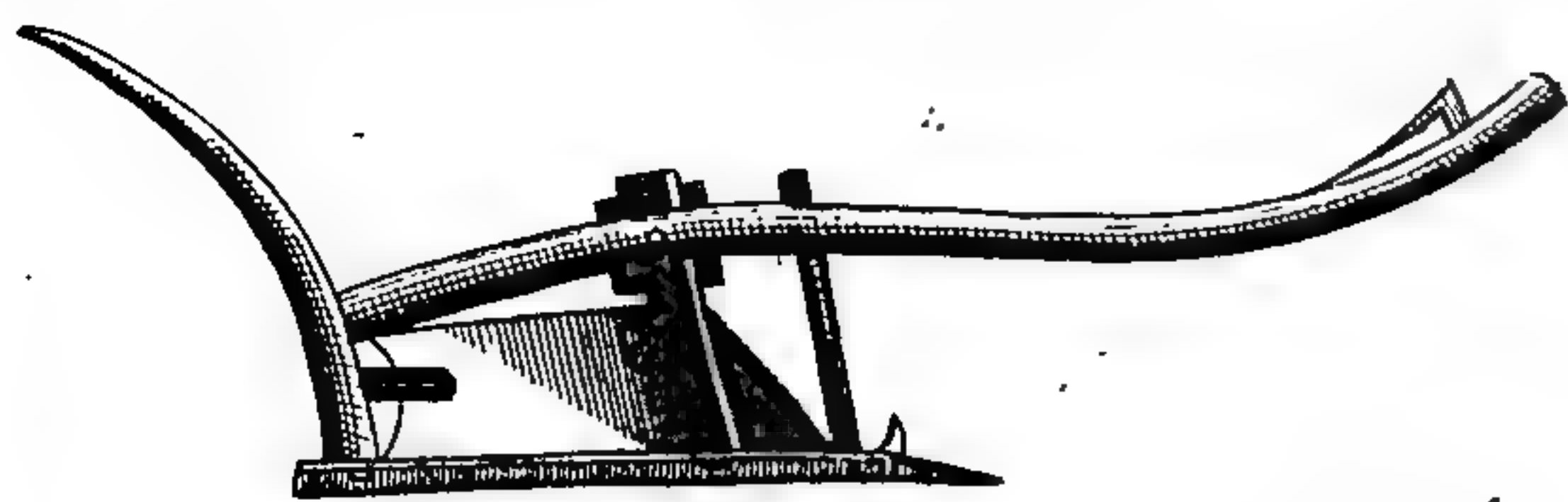
There is great Difference between a tough Clay, and a light and loose Sand: one of these Soils requires one and another Kind of Plow,

and of plowing; neither would any use the same Instrument to till a deep Soil, and one where there is at five or six Inches Depth a Bed of Stone. There is often a Bed of barren earthy Matter also at this slight Depth, and this is not to be brought up with the Soil. All these, and a Number of other Particularities, demand their different Manners of plowing; and in order to its being rightly done, the Farmer is first to see there be a proper Instrument, and next to follow the Work with his Eye, that the Instrument be properly used: that the best Part of the Soil be not left untouched where it lies deep; nor the barren Part raised up where that lies shallow.

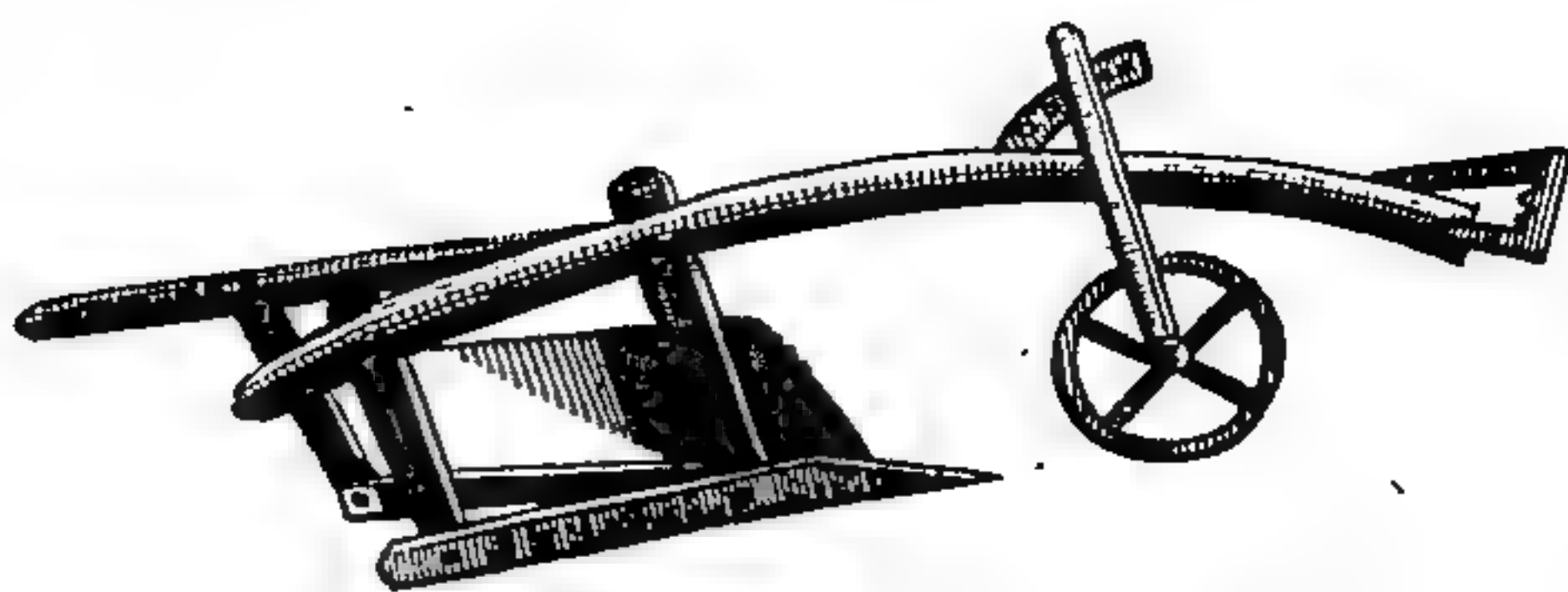
These light and shallow Soils work easily, and cost little in Tillage; but then they are often so poor, that they require a large Expence for Manures. Tillage alone, as we have said, will make almost any Land bear Crops; but Manure is to be added to these, that the Crops may be great.

On the other hand, the firm and tougher Soils depend more upon Tillage than any Addition of Manure. In these, Plowing comes dear, but the Expence in the other Article is so much lessened.

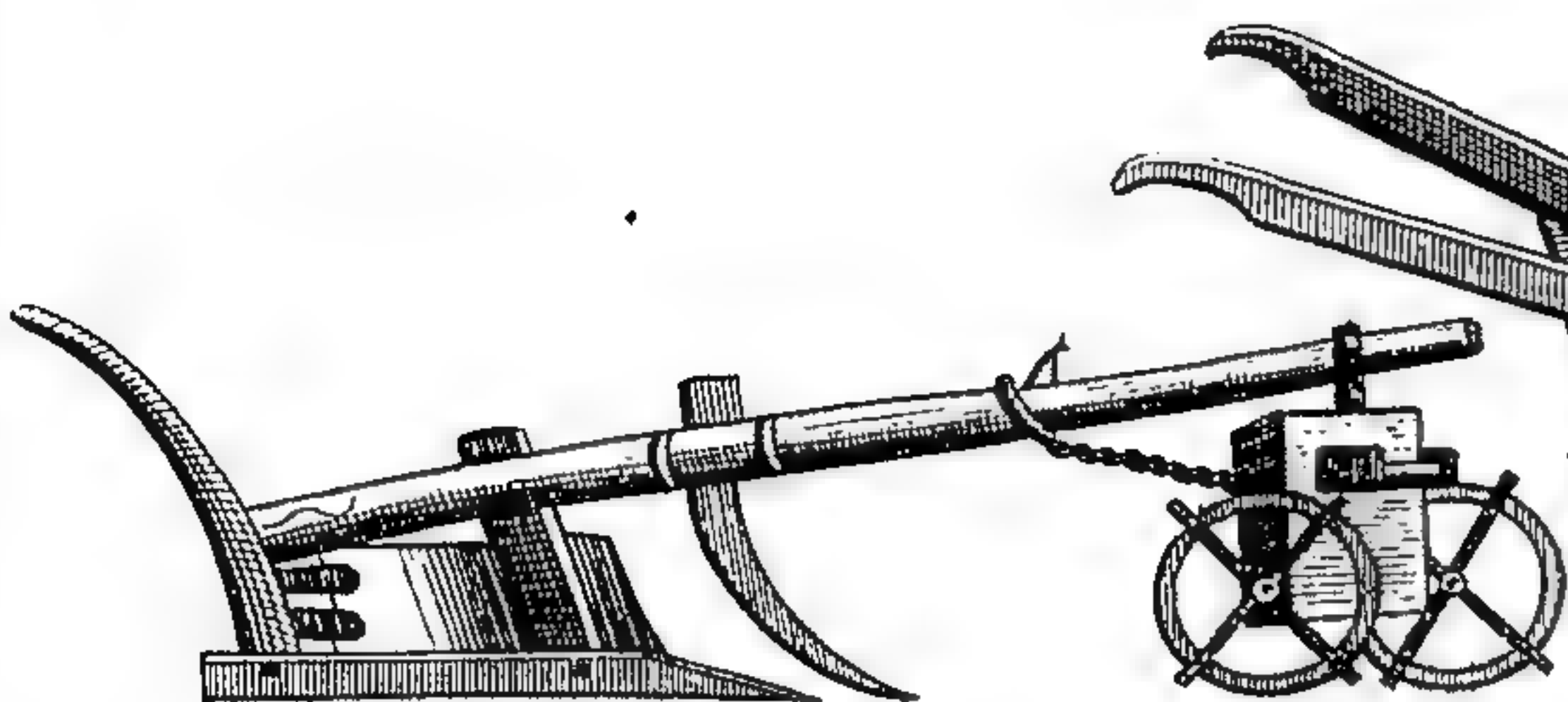
All that has been hitherto said concerning Plowing, regards the Time before sowing the Land; but we are to mention also under the Head of Plowing, another Species of Tillage, which is performed after the Plants appear; this is, properly speaking, not Plowing, but Hoeing; though, according to the new Method of performing it by a Kind of Plow, and with the Assistance of Horses, it has got the Name of Plowing. This is the Kind of Tillage called Horse-hoeing Husbandry, of which we shall give the Reader a full Account among the several other Methods. It has its Foundation upon very rational Principles; and its Success answers accordingly: but there is a Backwardness of bringing it into Use, which seems to arise only from its Novelty. In other Countries where they are more ready than we to try Experiments, it is got into Use, and we can assure the ENGLISH Farmer with great Advantage. We hope therefore to see it soon introduced in the proper Soils, and under proper Circumstances, here.



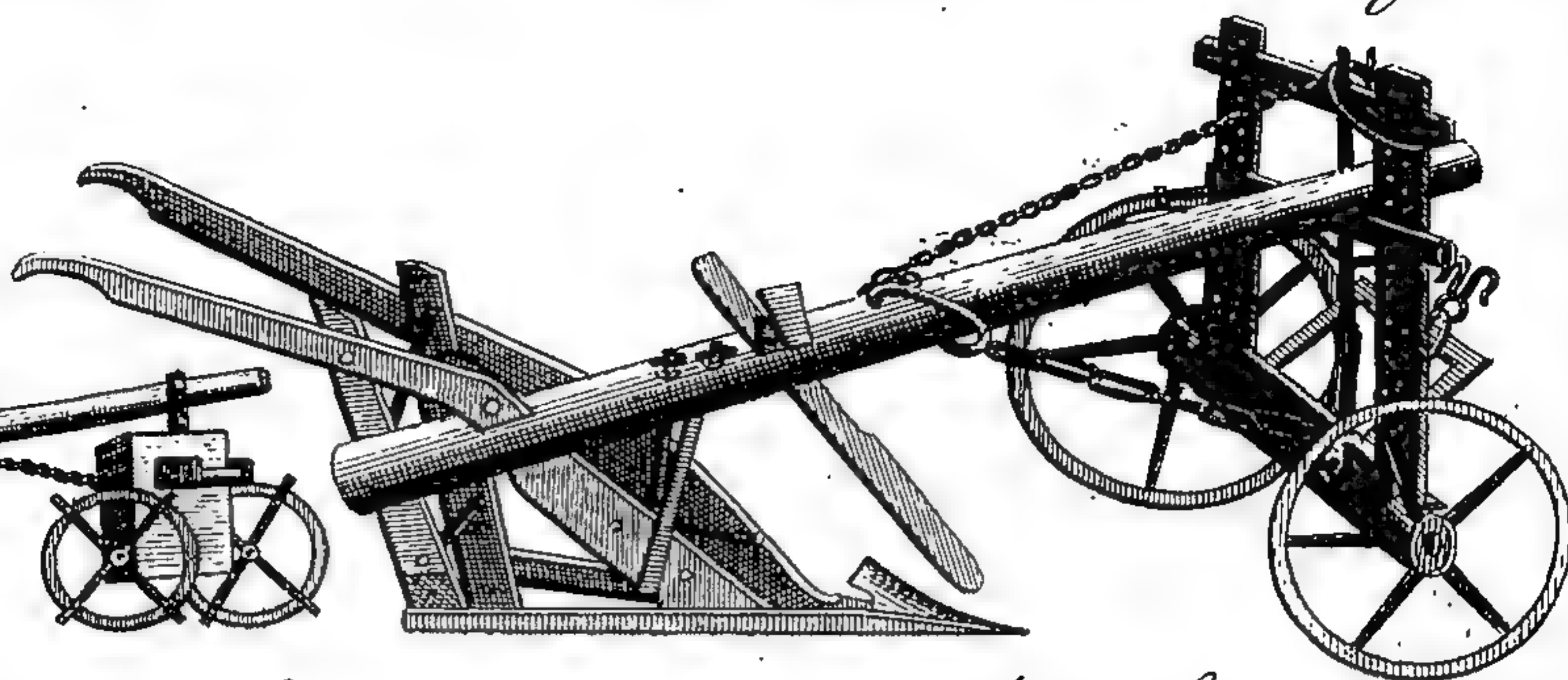
The original Plough without Wheels.



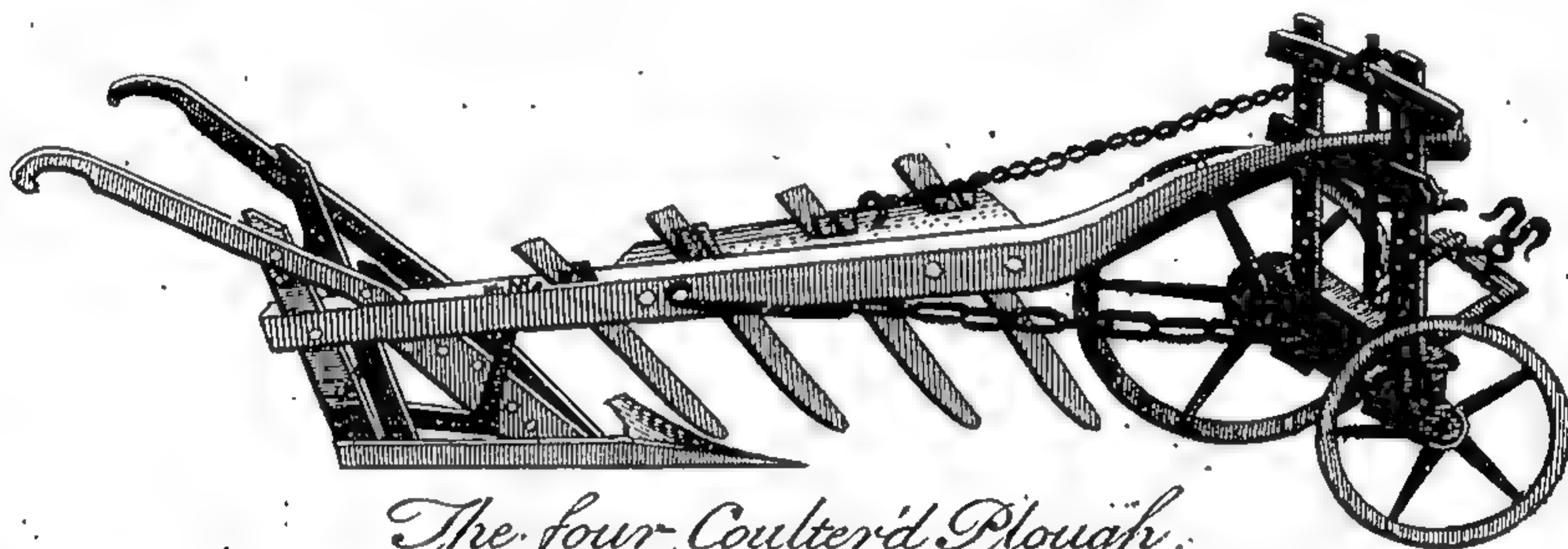
The one wheeld Plough.



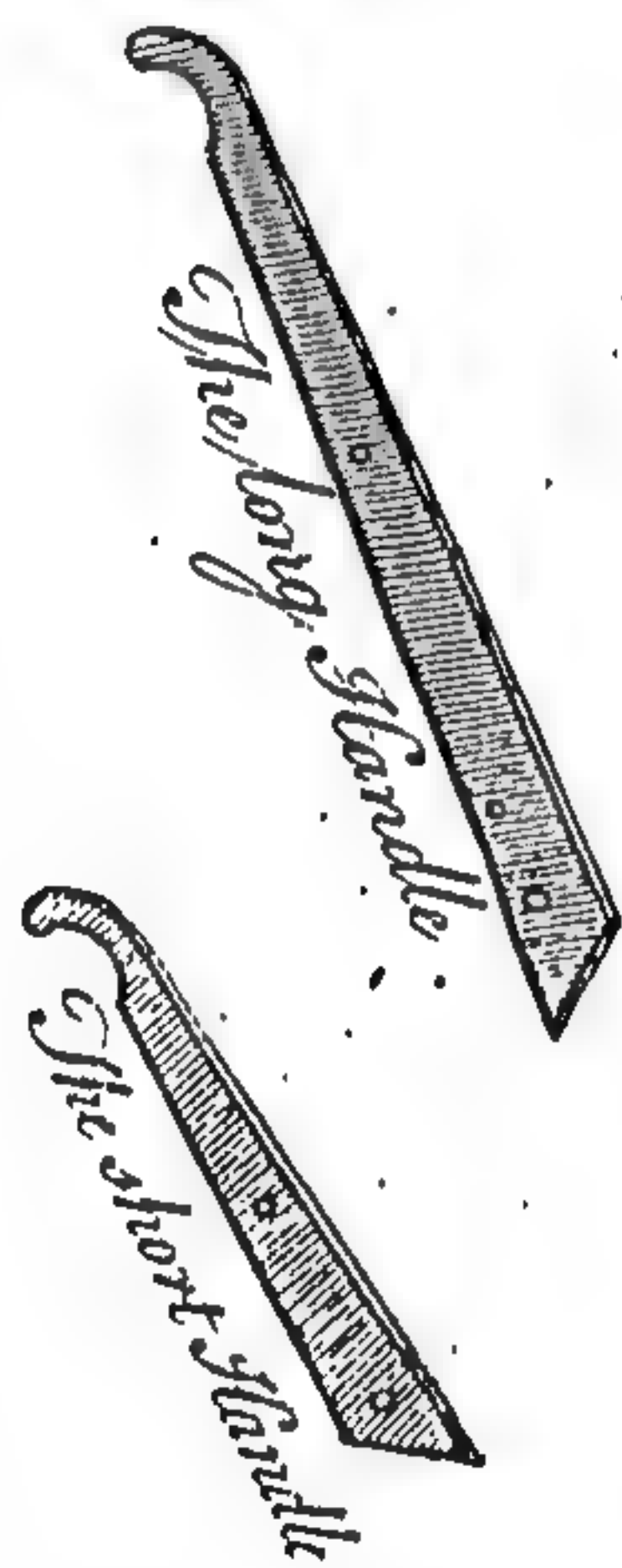
The original two wheeld Plough.



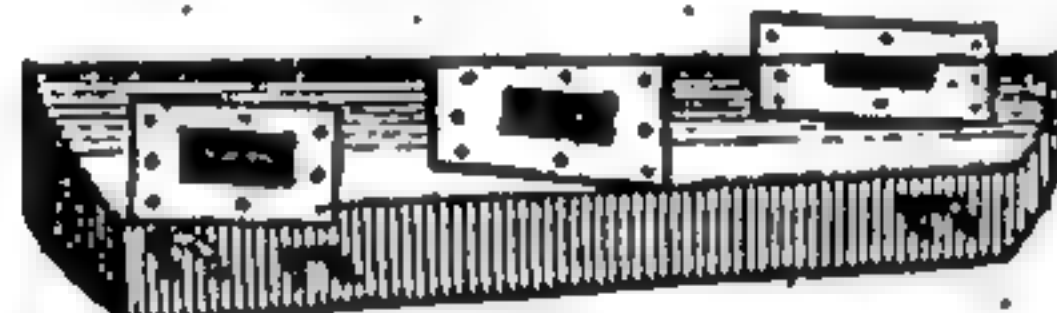
The two wheeld Plough improv'd.



The four Coulter'd Plough.



The Square Collar.



The Piece added to y Beam.



The Wild.



The hinder Sheet.

The Dock.

A Nut.



A Coulter.

Parts of the four Coulter'd Plough.



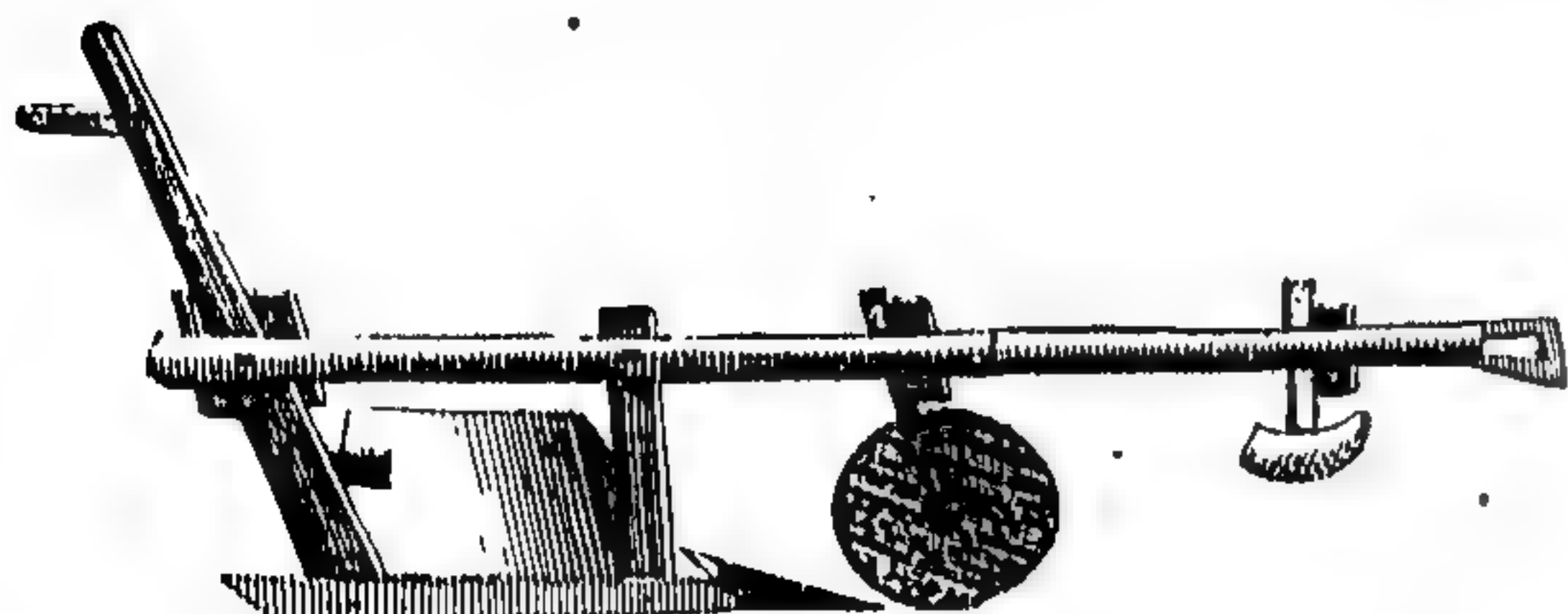
The Ground Wrist.



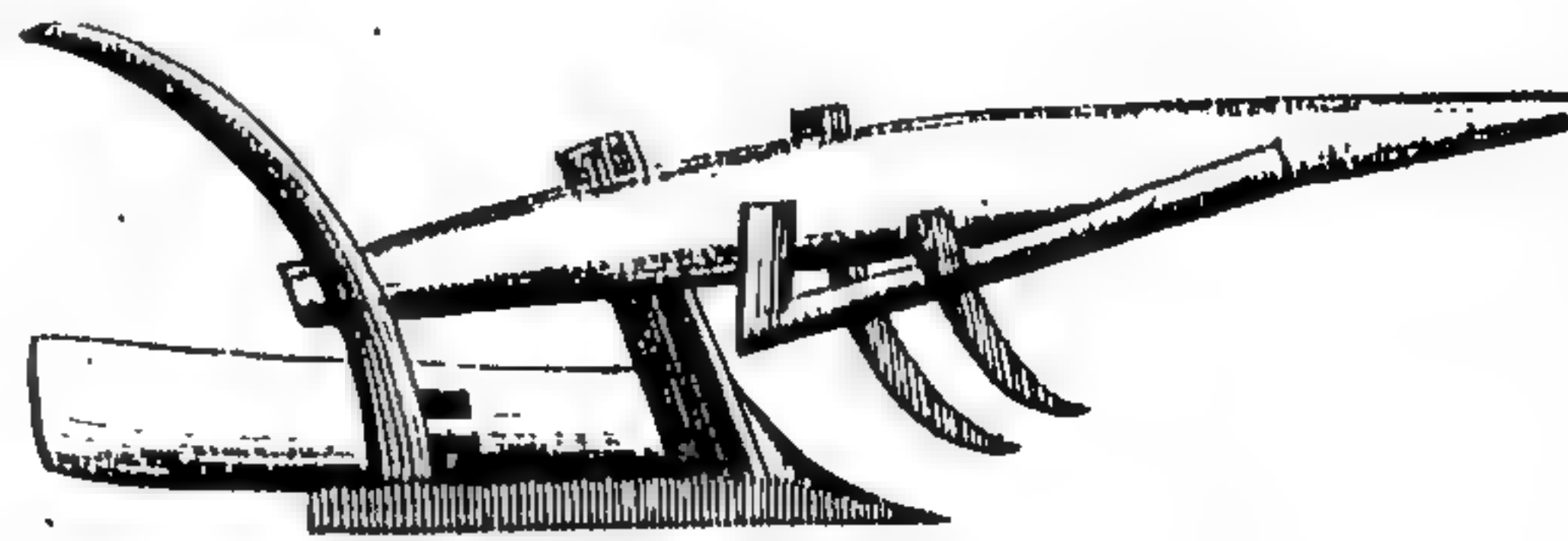
The Earth-board.



The Share.



The wheel Coulter'd Plough.



The Plough to cut Drains.

C H A P. XXIII.

Of the Form of the antient Plow.

WE may see in this Matter of the Plow, that the most useful Things are neglected, if they be common; and those who have it in their Power to be of greatest Service to the World, by considering and improving them, least regard them. There is no such Thing as an Author of any Note who has written on the Structure and useful Variations of this Instrument; nor have Men of Genius and Knowledge concerned themselves in the Fabrick of it. Ploughs seem to have been invented in the rudest Times; and, till very lately, to have had little Improvement. What has been done on this Head, however, by some ingenious Persons within these few Years, shews what is practicable; and we hope will lead others to the same useful Pursuit.

The first Kind of Tillage was probably with the Spade, and were that as convenient for large Quantities of Ground, as it is useful where it can be properly employed, no Instrument in the World could be compared to it. But when whole Fields came to be turned up and tilled, it was natural to devise some Method of saving the Labour of Men; and, consequently, the Plow, which may be called a Kind of Spade drawn by Horses, was invented.

As this was more and more frequently used, its Form became probably a little altered, but Improvements have been in nothing so slow: and this Instrument of such universal Use, and vast Advantage and Importance to Mankind, is still capable of many more; and it still wants them.

All Tillage we have shewn has its Advantage from dividing and breaking the Earth into a great many Parts. The Spade, as it is wrought by the Hand of the Workman, does this most perfectly; and it is for this Reason that Gardens are more fertile than Fields; but it may not be impossible, if proper Persons will set themselves about it, now that they know in what the greatest Perfection of Tillage consists, to make the Plow, by more Improvements, equal its Effect.

The Advantage of the Spade over the Plow is, that it goes deeper, and divides the Land into more Particles, and smaller: but the Plow, when its Structure shall be fully perfected, is certainly capable of this. The four coultered Plow is an excellent Contrivance, and shews that there is nothing impracticable in the Thought of forming a Plow that shall go deeper, and divide the Earth as much or more than the Spade.

The antient Plow, according to the best Accounts we have of it, had no Coulter, nor Earth Board, for the Share always going obliquely, served as an Earth Board; and the two Ears which were the Corners of a Piece of Wood lying under the Share, did the Office of Ground Wrecks.

This Sort of Plow is used in ITALY, and even

in some Parts of FRANCE at this Time. It serves for the turning up of light Land, but it would do nothing with our stiff and tough Soils in many Counties.

This, so far as we know, was the first and original Plow, and it is a very plain and simple Contrivance. It did the Office for which it was intended, in the Place where it was invented; but it was not fit for other Lands, and other Countries, and therefore it was altered.

In those Parts of ITALY where the Soil is perfectly soft and mellow, this Instrument does very well to keep it in Tillage; but even in these favourable Lands it is very unfit for the bringing them into this Condition; for when they have lain in Grass, and have any Thing of a Turf upon them; it is very difficult to manage them with it. They are obliged to go two or three Times over the Land before the Turf is all broken.

These Plows, for want of a Coulter to cut the Turf, tear it to Pieces with great Awkwardness and Difficulty, but when it is once cut through, the Soil being soft and tender, they easily get deeper.

As our Soil is very different from that of those Countries, our Plows are necessarily made different, for otherwise they could not cut it. The Necessity of a Coulter to ours is very plain, because of the Thickness to be cut, and that Necessity was doubtless the Mother of the Invention. Our Plows, when well made, cut off the Furrow at the Bottom flatwise, and therefore as it is as thick on the Land Side as on the Furrow Side: but the Plow cannot break it off from the whole Land at such a Thickness, so that there must be a Coulter to cut it off. By this Means the Furrow is turned perfectly whole, and no part of the Turf of it is broken. Hence if it lie long without new turning, the Grass from the Edges will spread, and form a new Turf or Sward on the other Side, which was the Bottom of the Furrow before turning, but is now become the Surface of the Earth.

If the Land be left thus, it will soon be greener with Grass than it was before plowing, and the Grass spreading its Roots, will bind it firmly and toughly together; so that there will require a great deal of Time and Labour to bring it into a Condition for the Service it is intended to answer.

This has shewn the Insufficiency of the common Plow, and from a Sense of this, has arisen the Invention of the four coultered Kind, to be described hereafter. Several others have been devised to answer the same Purpose, but none succeed so well.

C H A P. XXIV.

Of the several Kinds of Plows in common Use in England.

THE common Plow differs very much in Shape and Form in various Places; partly according to the Fancy of the People, and partly to the Nature of the Ground. Some have longer and some shorter Beams; and there

are great Varieties in the Length and Form of the Share, the Coulter, and the Handles.

In general, without regarding the Customs of particular Places, there is great Reason to have Respect to the Nature of the Soil on which it is to be used. Thus, in general, the Plow that is for stiff Clay should be long, large, and broad, with a deep Head, and square Earth Board, so that it may turn up a large Furrow. The Coulter should be long, and very little bending, with a very large Wing; and the Foot long and broad, so as to make a deep Furrow. The Plow for moderate Soils should be somewhat smaller than the former, but broad at the Breech: the Coulter should be long and more bending, and the Share narrow, with a Wing coming up to arm and defend the Earth Board from wearing. The Plow for light Soils, such as sandy and the like, should be lighter and smaller than any of these. The Coulter should be more circular and thinner, and the Wing not so large.

This is a Direction contained in a small Compass, yet it will give the Farmer the general Rule for his Conduct in this Respect: let him consider his Soils under these three Heads of heavy, moderate, and light, and in this general Manner suit the Bulk and Fabrick of his Plow to them; and he will never make any great Errors.

Plows are sometimes made with Wheels, and sometimes without, but in general the Wheels are a very great Advantage; there are Circumstances in which they are troublesome, and therefore it is fit they should be in some Plows omitted.

The Plow, which from its great Advantage above the others, might be esteemed the first great Improvement in ENGLAND, is the Wheel Plow, that from the Place where it was first us'd has been long call'd the HERTFORDSHIRE Plow. This consists of a Beam and Handle, a Neck, an Earth Board, a Sheath, a Share, a Coulter, a Pin, Pillow, and Wheels. These are Parts exceeding familiar to the Farmer, but for the Sake of the Generality of Readers, who may not be acquainted with the practical Part of Husbandry, they will be explained in the Figures, and we shall also shew how this Plow is form'd, as improved at present.

This HERTFORDSHIRE Plow, or common Wheel Plow, as it is usually made, is very strong, and is serviceable for most Uses: it is very easily managed, it follows the Horse lightly, and it suits almost every Kind of Land. The greatest Exception to its Use is in miry Clay in Winter; because the Wheels cut into them, and clog and stick when they are work'd at that Time of the Year. This is fit for that Sort of Ground when Summer Fallows are to be plow'd, and when a Grass Ground is to be first turn'd up for Arable, for it turns the Turf very well, and is very fit for uneven Ground, and for the driest Summer Weather. Some make this Plow in the original Manner, with the Handle sloping of one Side, but this renders it troublesome to hold, or to follow; the Remedy was very easy, and People not bigotted to foolish Customs, have improved it greatly by making it strait.

This is in a Manner the general Plow at this Time, and it is thus varied more or less, but never much, according to the Pleasure of the Owner,

or Fashion of the Place, that we shall always mean when we say the common Plow.

The ESSEX Plow, (for the best Way to distinguish these Instruments is according to the Places where they are used,) has its Earth Board, if the Expression may be allowed, made of Iron; by this Means they make it rounding, and this has a great Advantage in the turning of the Turf, they generally make it light and fine, and the Wheels proportioned. It is in this Way very fit for light Soils, and rids a great deal of Business. We do not mean by calling this the Essex Plow, that they use no other in that County; but that is the Place where this Kind is most used, and seems to have been invented.

The LINCOLNSHIRE Plow owes its Invention and Form also to the general Nature of the Soil in that County. The Fen Land of that Place is, as we have before described under the Article of Soils, light, soft, and mellow, free from Stones, and naturally over-grown with Weeds and Sedge on the Surface; for this Land they use a Plow with a circular turning Coulter, and a large sharp Share, this is often a Foot broad, and quite sharp at the Edge. This Plow has no Wheels. There is a Foot at the fore Part of the Beam, which they set higher or lower with a Wedge, and by that Means they keep the fore Part of the Plow from growing deeper than they chuse. And they have also Wedges for setting the hinder Part where the Handle joins the Beam. The Coulter stands in its usual Place, before the Share, and is a round Iron Wheel, with a sharp Edge, that turns upon an Axle as the Plow moves, and cuts through the Roots of the Sedge or Grass as it goes round, while the broad Share cuts the Bottom. This would not do on other Land, but where the Soil is of this free and fine Kind, and is thus cover'd with a tough and tangled Matting of Roots, it answers the Purpose excellently.

The Dray or Drag Plow was at one Time, in a Manner, universal, and there is no particular Place where it can be said to be most in use at this Time; for it is retain'd in some, and rejected in others, according to the Sense and Spirit of the Farmers in adopting Improvements. It is a very plain and simple Kind; but notwithstanding the Advantage the others have over it, on many Occasions, this still excels them all for wet Clays in the Winter Plowings; for having the least Workmanship of any, it is the least apt to clog, and having the fewest Parts it is fittest for such Ground, where nothing is requir'd but going on, and turning up. It is limited to this Use, for on other Soils, and at other Seasons, it is very much inferior to the other Kinds. This Plow has no Wheels, and it consists of a Beam, Handle, Earth Board, and Share, and is set higher or lower, as they find Occasion, by Wedges at the Sheath.

In SUSSEX they have a Plow with one Wheel, it is a very ill contrived, and very inconvenient Instrument. 'Tis broad in the Breech, and therefore it draws very heavily. It is a clumsy and ill-contrived Kind, that is growing out of Use there; and of all the Plows that have been invented, is the least worth introducing any where else.

The largest Kind of Plow us'd in ENGLAND, or perhaps in any Part of the World, is that which; in some Parts of the County of CAMBRIDGE, they use for cutting of Drains. This is of the Shape of the common Plow, and has no Wheels: it is very bulky in all its Parts, and has two Coulters; one of these is fix'd in the Beam as usual, and the other in a Piece of Wood, fastened to the Beam for that Purpose, these both turn inwards, and cut each Side of the Trench. The Share is very broad and flat, and cuts the Bottom of the Trench. The Earth Board is three Times as long as in other Plows, and casts the Earth a great Way off the Trench. This Instrument cuts a Trench a Foot and half wide at the Top, a Foot at the Bottom, and a Foot deep. It is excellent for this Purpose on wet Lands, saving a great deal of the Expence of Work in the common Way of digging Trenches by Hand, but it requires a great Number of Horses to draw it. There is something in the Contrivance of this Plow, that may be useful farther than in the making of Trenches, and it is for that Reason proposed here to the Farmer's Consideration.

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#### C H A P. XXV.

##### *Of the Uses of the common Plows, and their proper Make.*

**W**HERE there is a hard and firm Soil; or where the Land is full of Flints, sharp Stones, and Gravel, no Plow whatsoever does so well as the two wheel'd Kind, which may be suited to the Occasion according to the Directions already given, with Respect to Strength: and where strong Clays are to be wrought in Summer Fallows, no other Plow is equal to it. The Point of the common Plow will fly out every Step on these Occasions, but this will answer very well when the Earth is so baked and hardened by the Sun, that no other will penetrate. The Wheels of this Plow should be about twenty Inches in Diameter, and it will always run best if the Furrow Wheel be made a little larger than the other.

A great Advantage of this Plow also is, that it will work upon uneven Ground without levelling, so that none is equal to it for the plowing up of Pastures where there are Molehills, and other Irregularities. These disturb the other Plow extremely, even the least of them, but this goes through all.

Although the single Wheel Plow of SUSSEX be so clumsy and ill contrived an Implement, there is no Reason why the Use of a Plow with one Wheel should be rejected. A very light and slender made Plow may be furnished with one Wheel instead of two, and it will answer excellently on light sandy Soils. It will not be fit for harder Work, but running easily it will serve this Purpose better than any other.

The common two wheel'd Plow is to be drawn with Horses or Oxen two a-breast. The heavy Plow without Wheels, which is useful for wet Clays, and other very heavy and disagree-

able Work is to be drawn by three, four, or five Horses in Length. The great Use of this is where the Ground lies level, and where there are no Obstructions of Roots, or the like, for these greatly disturb its Operation. The two Wheel Plow is preferable in such Cases, notwithstanding all its Inconveniences.

Whichever of these Plows the Husbandman chuses, let him take Care in the Make of it, that it be suited to the Soil upon which he is to use it. Let him see that it be made larger if it be for deep or strong Soils; and lighter and smaller if for the light and shallow ones. When the Land is stiff and deep let the Coulters be long and strong; in the deepest Soils the Coulters must go the deepest, because the Weeds root deepest there.

Of whatever Form, or whatever Degree of Strength, let him see that the Iron Work be made true as well as sound; for on the Exactness of this Part of the Instrument, depends the going of it true to the Pitch at which it is set, and its keeping to the Line wherein it is plac'd, without running out on one Side or the other.

As so much depends upon the Iron Work, it is a very prudent Method to have that made first, and wrought to a perfect Truth, and then to have the Wood Work made to it: for in the common Way of making the Iron to the Wood Work, the Smith is often forc'd to work wrong in order to suit it: in this Case no Art will make the Plow go well. Let him take Care that the Iron Work is wrought smooth, and rightly temper'd; and that it be kept bright and clean in the using.

The shorter and less the Plow the easier it is worked; but though this be a Recommendation in light Soils, there is no using of such as have not a due Weight and Strength in tough and heavy Work.

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C H A P. XXVI.

Of the Improvements of the common Plow.

THE Regard that has been shewn to Husbandry of late Years, has occasioned several Improvements of the Plow, for particular and also for general Purposes, and several new Forms and Kinds have been invented, some rather fanciful than advantageous, but others extremely useful. There is no Part of Husbandry in which more Improvement may be made, nor any in which it will be so immediately or certainly useful.

A double Plow has been invented some Years ago, and is at this Time in use in some Places, by which a double Quantity of Land is plowed at a Time, one Furrow by the Side of another. As this requires twice the Number of Horses and of Men, the Expence is nearly equal to the Advantage; but this is a Hint capable of Improvement, for although in tough and deep Soils it loses its Benefit, from the Necessity of a double Expence, yet certainly in some of those light and shallow Lands we have in BUCKINGHAMSHIRE, and other Places, a double Plow might be so contriv'd,

triv'd, as to be drawn by two Horses, and managed by one Man; and then certainly the Advantage would be double, and the Expence the same. This has never been put in Practice yet, but from what I have seen; I am very certain that it is practicable; and whoever shall bring it into Use, will be of great Service both to himself, and all that shall follow him.

There has also been a Contrivance of a Plow that turned up two Furrows at once one under another. This I have seen used, but it is so unwieldy, and difficult of Draught, that in its present Form it will never get into Reputation, nor is it fit for it; but we have seen already, what would be the Advantage of plowing deeper than ordinary, and that is enough to spirit up some who understand a little more of the Mechanic Arts to contrive one upon the same Plan with more Judgment. Doubtless it is possible to obtain this Advantage of deep plowing with much less Trouble than attends it in the Plow that has hitherto been contrived for that Use.

We have observed that the digging with the Spade is a much finer and more excellent Tillage than that with the Plow; and that the Reason why our Gardens are more fertile than Fields of the same Soil, and with the same Manure is, that the Spade digs deeper, and breaks the Particles of Earth finer. Now a Plow constructed upon this Plan, with better Judgment in the Fabric of it, would have both those Advantages: it would dig full as deep as the Spade, and might be made to break the Earth as much. It is surely worth the while of those who have a Knowledge in the proper Arts, to devote some of their Studies to this Improvement of the Plow, which is doubtless the most useful Engine in the World; and at present very deficient, even in its most improved State. The adding Breadth to the Fin of the Dray or Foot Plow, will at all Times make it more and more serviceable in damp and stiff clayey Lands; and in plowing these the Horses should always go at Length, that they may tread less of the Ground: on the other hand, in light Soils, the Cattle, whether Horses or Oxen, should always go a-breast, for the double treading is serviceable to such Land; in the same Manner with the treading of Sheep when they are folded upon it. In stony Ground that has Grass of some standing upon it, the Plow should have a round pointed Share, with a Fin to cut the Roots of the Grass, for the broad Fin is apt to jump out of the Ground.

In Ground that has been Wood, and has Roots remaining; or in other Places where there are a great many large Roots in the Way, it is a very good Method they use in some Parts of STAFFORDSHIRE, of having an Instrument of Iron, with a sharp Edge, set through the Beam of the Plow, behind the Coulter, and through the Plow-head. This, at the same Time that it arms the Plow for cutting these Roots asunder, if rightly fix'd, strengthens the whole Frame of it, and makes it able to bear the rough Work there often is in these Places, and which else would tear it to Pieces: in other Places thereabout, they use a Couple of sharp Wings of Iron made fast to the Plow-share, which answers the same Purpose, but does not so strengthen the Plow. Dr. PLOT, in his History of that

Country, describes these, and gives the Names of their Inventors: I find they are in Use still, but not generally. These may give Hints severally, for there is not one of them but has its Use, nor one that may not be greatly improv'd.

But these are all of them Improvements, which rather shew what may be done, than execute it well in themselves; they may be considered as Hints to what is proper, rather than as compleat Things: there remains one to be spoken of in which the Improvement is very great, and is carried to a due Degree of Perfection; so that the Farmer has no more to do than to order it to be made according to the Description and Figure. This is the four coulter'd Plow, so highly and so justly extolled by the Author of the Horsehoeing Husbandry.

CHAP. XXVII.

Of the Wheel Plow.

THE Foundation of this Instrument is the common two wheel'd Plow, in its most improved Condition, from which it differs in the having three additional Coulters; so that instead of one there are four. We shall here consider this Wheel Plow in its most improved State; and in the succeeding Chapter describe the four coulter'd Plow form'd upon it. This Plow consists of two Parts, distinguish'd by the Names of the Plow-head and Plow-tail. The Head has two Wheels of about eighteen Inches Diameter, the Spindle or Axis of these is of Iron, and passes through a Box which stands crosswise of the Beam. This Spindle turns round both in the Box and in the Wheels. From this Box rise two perpendicular Staves, called Crow Staves; these are fastened into the Box, and have each two Rows of Holes, by Means of which the Beam of the Plow is raised or sunk at Pleasure, in order to increase or diminish the Depth of the Furrow. This is done by pinning higher or lower a cross Piece, which is called the Pillow, because the Plow Beam rests upon it. At the Top of the two Crow Staves is another cross Piece, called the Gallows. The Crow Staves pass through this by Mortises, and are pinned into it. From the Box of the Plow within the Staves, there is carried a small Frame composed of two Legs, and a cross Top, to which the Links of Iron are fixed by which the Plow is drawn; this Frame is called the Wilds of the Plow. In the middle of the Box there also is a Hole into which is let one End of an Iron Chain, the other End whereof is fasten'd to the Middle of the Beam, this is called the Tow Chain, and fastens the Head and Tail of the Plow together: at the End where it reaches the Beam, this has a Collar that goes round it, and is fasten'd by a Stake within Side the Box. This Stake is held up to the left Crow-staff by a Wyth, which passes round it above, and under the End of the Gallows below: a Piece of Cord is sometimes used instead of a Wyth: any Thing that may be tied will do. From the Top of this Stake goes an Iron Chain, called the Bridle Chain; this is fasten'd at one End to the Top of the Stake, and at the other to the Middle of the Beam of the

the Plow, by a Pin in the same Place where the Collar of the Tow Chain passes round it.

This is the Structure of the Head of the Plow, and these are its several Parts.

The Tail consists of the Beam, which is a stout and long Pole; through which, a little below the Pin that holds the Bridle Chain, and the Collar of the Tow Chain, there passes the Coulter, a long and slender Iron Instrument, which running downward and a little forward, ends near the Point of the Share. This Coulter is fixed in its Hole of the Beam by a Wedge, so that it can be raised or sunk at Pleasure; behind are two Handles, the one longer and the other shorter; the shorter of which meets the Head of the fore Sheat, where it enters the Beam, and is fix'd by a Pin, and fasten'd to the Top of the hinder Sheat by another Pin. These Sheats are two Boards, the hinder one near the Extremity of the Beam; the other forwarder and more slanting, and are both fasten'd to the Share, which runs flat below. On the other Side of the Plow Tail descends another flat Board, called the Drock; to this the Groundwrist is fasten'd, which is a Board running nearly parallel with the Share. The longer of the two Handles is also fasten'd to the Drock, and the Earth Board rises at its Bottom. The fore Sheat is supported by a double Retch, which passes through the Beam, and is fasten'd by Screws and Nuts.

This is the four Wheel Plow as used at present in the Places where Agriculture is most understood, and best practised: we see it consists of more Parts than the two wheeled Plow of HERTFORDSHIRE, according to the first Invention, but there is not one of these added Parts but is an Advantage in either Strength or Convenience.

C H A P. XXVIII.

Of the four coultered Plow.

WE have seen in the last Chapter the common Plow in its greatest State of Perfection; that is, the two wheeled Plow formed upon the best Model, and in the most artful Manner that has been yet devised for it. We are in this Chapter to give an Account of that great Improvement upon it, which, as it adds Parts of the utmost Use, may very well be considered as a distinct Instrument, its three additional Coulters giving it a Power of breaking the Land beyond any other that ever has been invented to this Time.

The Reader, who by the Assistance of our Figures and Descriptions, has made himself acquainted with the Structure and Parts of the two wheel'd Plow, will find no Difficulty in comprehending this.

The Beam of the common two wheel Plow, is usually eight Feet long; the proper Length of the Beam of the four coulter'd Plow, is ten Feet four Inches. The Beam of the common Kind is strait all the Way, but that of the four coultered Plow rises with a Bend when it comes toward the Wheels, to where it rests upon the Pillow. The Beam, supposing the Plow to

stand upon a level Surface, would be at the End of the Plow-tail only eleven Inches and a half from the Ground: at the Place where the Bend begins, which is a little before the first Coulter, it will be one Foot eight Inches and a half; and where the Beam bears upon the Pillow, two Foot ten Inches. This is the proper Make of the Beam of the four coulter'd Plow.

The four Coulters are thus disposed, measuring from the Tail or extream End of the Beam behind. From this Extremity to the Back of the first Coulter, is three Foot two Inches; this Coulter has its Point near the Share: from the Back of the first, to the Back of the next Coulter, is thirteen Inches; from thence to the third thirteen Inches, and from thence to the fourth the same. So that from the End of the Beam behind, to the Place where it begins to bend upwards, which is a little before the fourth Coulter, counting from the Tail, is seven Foot. The Length of the additional Coulters, particularly of the fourth, or that next the Head of the Plow, would be a great Inconvenience in this Machine, but that is prevented by the bending of the Beam toward the Head. If the Beam were strait as in other Plows, these Coulters must be very long to reach the Ground, and they would require to be very strong not to bend, and this would make them expensive and cumbersome; and at the same Time their Length, if ever so well form'd, would make them apt to loosen the Wedges wherewith they are fix'd in the Holes. This would make the Coulter rise up out of its Work, but by this Contrivance of a crooked Beam, a moderate Length in the Coulters serve; they do not require any great Thickness or Quantity of Iron, and they always work with Regularity.

As to the Materials, the Beam may be made of Ash or Oak, according to the Nature of the Ground whereon it is to be employed; for Ash has the Advantage of being light, but the Oak is vastly stronger; so that when the Work will be very hard, the Oak in Spite of its Weight, is preferable. As to its Breadth and Thickness, they may also vary according to the Soil that is to be tilled; but for moderate Ground, the Beam at the first Coulter Hole should be five Inches deep and four broad.

Giving this as a middling Proportion, the Size of the other Parts may be as follows. The fore Sheat, commonly called simply the Sheat, should be seven Inches broad; the Retch upon it must be of Iron, and its left Leg must stand foremost, that the Edge of its forepart, which is flat, may fit close to the Wood of the Sheat. The Use of this Retch is to hold the Sheat up to the Beam, which it does by Means of Nuts and Screws. Through the top Part of the Sheat there is also to be a Hole, which is to be a small Part within the Beam, so that a Pin being driven into the Hole, draws up the Sheat very close to the Beam. The Elevation of this Sheat is a very great Article in the Management of every Wheel Plow. If this make an Angle of more than five and forty Degrees with the plain Surface whereon the Plow stands, that Instrument will never go well. In the four coulter Plow it ought

to make an Angle of forty-two or forty-three Degrees only.

This Sort of Expression will be very well understood by those who are used to Mechanics; but for the Sake of the common Farmer, we shall say all that is meant by it is, that the Sheat is to be a little less raised in this than it is in a well going common Wheel Plow.

The Length of the Share from the Point to the Tail, should be three Foot nine Inches. The Fin of the Share rising slanting from the Point upwards. The Point of the Share should be three Inches and a half long, flat underneath, and round at the Top, and this should be of hard Steel underneath. The Edges of the Fin also should be well steeled, and its Length proportion'd to the Nature of the Ground.

Behind the Fin is placed the Socket, into which the Bottom of the Sheat, before described, enters; and from the Tail of the Share is to rise a small Plate of Iron, this is to be well rivetted to the Share: by this the Tail of the Share is fastened to the hinder Sheat. This fastening is done by an Iron Pin, with a Screw at the End, to which a Nut is to be screwed on the inner Side of the Sheat.

The Socket is to be a Mortise of about a Foot long, at the upper Part two Inches deep; and the fore End must not be perpendicular, but made slanting, conformable to the fore Part of the Sheat that enters into it. The upper Edge of the fore Part of the Mortise must bear against the Sheat; and if it be not quite so slanting as the Sheat, a little of the Wood is to be pared off at the Edge to make it fit.

The upper Side of the Share should be perfectly strait, but its Neck on the under Side should stand a little hollow from the Ground. This Hollowness should be about half an Inch in a common Plow, but in the four coulter'd Plow it should not be above a Quarter of an Inch. So that the Share, when it is first made standing upon its Bottom, bears upon the level Surface only in three Places: these are the Point, the Tail, and the Corner of the Fin. The Hollowness of the Fin must be greater in a stony Soil than in others.

The placing of the Share rightly upon the Sheat, is the most important, and the most difficult Part of the Plowright's Trade: on this depends the well going of the Plow, and for this Reason; as it is more important in the four coulter'd Plow than in any other, we advise the Farmer when he has made himself a Master by these Figures and Descriptions of the Form and Structure of this Plow, to take Care that he employ a skilful and an honest Workman; and if he do not find the Plow go well when made, to look there for the Occasion of the Fault, for in that part is generally the Seat of it.

The Groundwrist is to be of Iron, its Length must be two Foot five Inches, its Breadth at the longest End four Inches, and it is to go somewhat smaller all the Way. Its Thickness in general is to be three eighths of an Inch; but at the smaller End it is to be much thinner, that it may be capable of bending so, that it can be brought close to the Share.

At the smaller End of the Groundwrist are to

be four Holes, through one of which there goes a Nail that fastens the Groundwrist to the Sheat. This passes through a long Hole which is made in the Side of the Socket of the Share. The Space between the Outside of the Groundwrist, to the Outside of the Share, is eleven Inches and a half, and this is the Width of the lower Part of the Plow-tail at the Ground: at the upper Side of the broad End of the Groundwrist there are also several Holes by which it is nailed to the lower Part of the Drock, this is long, narrow, and has three Holes for the Reception of its Fastenings.

The Earth Board has a rising near its End, which takes hold of the End of the Sheat to fasten it the more firmly; and near that are two Holes by which it is fix'd to the Sheat; at the other End also there is a Hole by which it is fasten'd to the Drock.

The Pin which fastens the Earth Board to the Drock, is to be thicker in the Middle than at the End, and this prevents the Earth Board from coming near the Drock. By Means of this Pin the Earth Board is also set at a greater or smaller Distance from the Drock, as there is Occasion sometimes to throw off the Furrow farther from the Plow than at others. It always stands a good deal farther out on the Right Hand than the Groundwrist, and this is one Reason why the Drock is made crooked; bending outwards in that Part.

The long Handle of the Plow is to be five Foot four Inches in length, and four Inches broad in the widest Part. It is to have Holes in its lower Part for pinning it to the Sheat, and another near its upper End by which it is fasten'd to the Drock.

The Length of the short Handle is three Foot nine Inches, and it is to have two Holes, both toward its lower End: by the upper Hole it is pinned to the hinder Sheat, and by the lower to the Top of the fore Sheat above the Beam of the Plow.

We come now to describe the placing of the four Coulters in the Beam of this Plow, contrived for their Reception; this is the most important Article of all: and the greatest Point to be obtained is, that the four imaginary Planes, described by the Edges of the four Coulters, as the Plow moves forwards, be all parallel or nearly so, for if this be not regarded, they will not enter the Ground together.

To make sure of this important Point, the Holes for the Coulters must be made in the Beam of the Plow in the following Manner. The first Coulters is to be placed as already directed, the second Coulters Hole is to be made two Inches and a half more on the Right Hand than the first: the third two Inches and a half more on the Right Hand than the second; and the fourth two Inches and a half more on the Right Hand than the third. This will place the four Coulters conformable to the four Cuts they are to make in a ten Inch Furrow.

Now no Beam of a Plow is broad enough to hold these Holes in this Direction, and for that Reason a Piece of Wood is added to the Beam of the four coulter'd Plow to give Space for it. This Piece is to be very well fasten'd to the Beam,

Beam, and the second Hole is to be made, as will be seen, according to the Distance, partly in the Piece, and partly in the Beam; and the others will be all made entirely in the Piece. The Piece is best fasten'd by three good Screws with their Nuts, and its Place is on the Right Side of the Beam. The Distance of each Hole to the Right of the last, must be measured from the Middle of one Hole to the Middle of the other.

The fore Part of every Hole must incline a little to the Left, so that the Backs of the Coulters may not bear against the Left Side of the Incisions made by the Edges. Each Hole is to be a Mortise of an Inch and Quarter wide, with its two opposite Sides parallel from Top to Bottom. The Length at the Top is three Inches and a half, and at the Bottom three Inches: and the Back of each is not perpendicular but slanting, and makes the Coulter stand slanting. It is fixed in this Mortise by a Pole Wedge in the same Manner as the Coulter is in other Plows.

The Coulter is a Kind of Iron Knife, consisting of two Parts; a Handle, and Blade; the latter having an Edge. The Length of the Coulter is to be two Foot eight Inches, but it will shorten in wearing; the Blade is to be sixteen Inches long, with its Edge running all the Way along it; the Handle is to be of the same Length. This is so long that it will at first very well stand up above the Beam, but it must be driven down lower and lower, as the Point shortens by wearing. The Handle is to be an Inch and seven-eighths broad, and seven-eighths of an Inch thick throughout.

The first Coulter in all Plows should be so placed, that its Back should bear against the Back of the Hole; its Right Side above to bear against the upper Edge of the Hole, and its Left Side to bear against the lower Edge: and for this Reason there always are required at least three Wedges to hold a Coulter in its Place. The Pole Wedge stands before it, the other two, one on the Left Side above, and the other on the Right Side underneath: and the Hole must be so made, that the Coulter standing thus across it, its Point may incline two Inches and a half or more toward the Left than the Point of the Share if it were driven down as low as it: but it should never be so low in any Plow whatsoever. As to its bearing forwards, the Point of the Coulter should never be before the Middle of the Point of the Share. It must be set obliquely with Respect to the Share, as we have disposed it in the Figure of the Wheel Plow, and it must never be set much more slanting; for if it should, it would have greater Force to raise up the Pole Wedge, and would be continually getting loose.

In the four coulter'd Plow, the three other Coulters are to stand in the same Posture with this in Respect of the Inclination of their Points to the Left: this is a great Advantage to them; for by that Means when the Fin is raised up by turning the Handles toward the Left, their Points do not rise out of the Ground on the Right Hand as they otherwise would. With Respect to their pointing forwards, Experience shews, that every one of the three should be set

a little more perpendicular than the next behind it; so that the fourth Coulter will stand nearest to perpendicular of any of them.

None of these Coulters ought to descend so low as the Bottom of the Share, unless when the Plowing is very shallow. It is always sufficient that they cut through the Turf, however deep the Plow go into the Ground.

When the Plowing is to be very shallow, the Fin of the Share should be broad enough to cut off the fourth Piece of the Furrow.

The Nut which serves for fastening the Piece to the Beam of the Plow, should have two opposite Corners turned up, by which it may be driven round with a Hammer. This has so great a Force, that three of these will hold the Beam and the Piece as firmly together, as if they were one Bit of Wood. In dry Weather the Wood will shrink, and then the Nuts are to be driven farther on. The same Caution must be observed in other Parts of the Plow. Between the Nut and the Wood there should be a thin Piece of Iron by way of Bolster; this prevents the Nut from wearing into the Wood, it must be something larger than the Nut, and of the Thickness of a Shilling. Some use a Piece of Leather, but when the Nut is to be often screw'd, Iron is much better.

There must also be Iron Plates upon all the Coulter Holes both above and below. These must be nailed on with Nails made for that Purpose.

Instead of a Collar moving round the Beam, 'tis much better to have a square one with an open End, which shall fasten to it by a Couple of Crooks. These must turn upwards, that they may not lay hold of any Thing that shall be turned up under the Plow; the Front or Close-end of this Collar is to be a strong Iron Bar, with several Notches. Two Pins are to be driven into the Beam of the Plow, just behind the second Coulter Hole, one on each Side: and there is to be another Crook, called a (C) from its Shape, which is to go over the close End of the Collar. Each End of this is a Hook, and one of these lays hold of the cross Bar of the Collar, going into one of its Notches; and to the other is fixed a Link, which holds the Tow Chain to the Collar.

The Use of those Notches, and this fix'd Position of the Collar is this; that as the Share wears at the Point, it always inclines a little to the Right; and this is remedy'd by removing the Crook into another Notch of the cross Bar of the Collar, so that the Point of the Share is thus always kept in a proper Direction. The Length of each Side Bar of the Collar should be a Foot.

We have shewn that the Tow Chain of the Plow is fasten'd within the Box by a Staff pass'd through its first Link, as the Hook of the Collar holds its last. This Stake is commonly nailed to prevent its flying out of its Place. And when the Plow is to be drawn a little nearer the Crow Staves, the Method is to take in another Link of this Chain, passing through the Stake, and fastening it as before: or it may be done better by taking hold of the Crook of the Collar, with a second or third Link of the Chain.

This

This shortening of the Chain always draws the Point of the Share a little to the Left.

For drawing of the Plow there is fasten'd to the Box an Iron Machine, called the Wilds; this is very like the square Collar, only its Legs are longer. The cross Bar at the Top is notched as that of the square Collar, but only one Leg of the Wilds is fixed to this square Bar in the making; the other Leg is loose, and has a Loop through which the other End of the cross Bar is put, so that it is fixed on at Pleasure. Both these Legs of the Wilds pass through the Box of the Plow, and are fasten'd in behind it by a Couple of hooked Pins made for that Purpose. The Holes cut thro' the Box for letting these Legs pass, are to be made slanting upwards, so that the fore Part of the Wilds may be higher than the hinder; otherwise the upper End of the Crow Staves will lean quite back when the Plow is drawn. The Use of the Notches in the Bar of the Wilds, is to give the Plow a broader or a narrower Furrow. A double Crook with a Link is fixed to this Bar, and by this the Horses draw. If these Cattle are tall, the Traces must be long, else they will be apt to raise the Wheels off the Ground, and overturn the Plow.

The Legs of the Wilds should be eight Inches and a half asunder, and their Length nineteen Inches: the Links are to be six Inches and a half long. They are to be put into two Notches distant from one another, or else one Wheel of the Plow will advance before the other. When they are moved to the Notches on the Right Hand, it brings the Wheels toward the Left Hand, which gives the greater Furrow; and, on the contrary, when they are moved on the Notches on the Left Hand, it gives the Plow a less Furrow, by bringing the Wheels toward the Right.

The Height of the Wheels we have mention'd already, as also the proper Method of making one of them higher than the other: their Distance should be two Foot five Inches and a half, as set from one another on the Ground. The Crow Staves should be one Foot eleven Inches high from the Box of the Plow to the Gallows that goes across them: these are to stand upright upon the Box, and they should be ten Inches and a half asunder.

The Pillow which crosses the Staves below the Gallows, is to be pinned up at its End by two small Iron Pins, and it is convenient to keep these chained to it, that if they chance to drop, they may not be lost.

The Height from the Ground to the Hole in the Box where the Tow Chain passes through, is to be thirteen Inches. This brings it to two Inches below the Holes of the Wilds, on the hinder Side of the Box.

The Height of the Plow at the Place where the other End of the Tow Chain is fasten'd to the Beam, should be twenty Inches from the level Ground; and about the Middle of the Tow Chain there should be a Swivel, that one End of the Chain may turn without the other.

This is the Construction of the four coulter'd Plow; and as it is founded upon the two wheeled Plow improved to the greatest Perfection, the

Parts of that Plow can never be so well understood as in the Description here given for their perfect and exact Construction. 'Tis therefore we have taken this Opportunity of entering into the full and exact Detail of them; and we have formed our Figures of them relatively thereto. It is very necessary that he who would undertake to make, or to give Orders for the making of a four coulter'd Plow, should first thoroughly understand the Construction, Parts, and Composition of a perfect one with a single Coulter; and we have by this Means avoided the Repetition of a long and dry Detail of the Parts.

We have before shewn what was the first Construction of the Wheel Plow, which was a vast Improvement upon the Instruments in Husbandry of that Time; and we have here explained its farther Advances toward that Perfection, which it may be justly said to have attained in the four coulter'd Kind.

When the four coulter'd Plow is made, let it be try'd with the single Coulter before the others are put on. There may be a Fault in the Work that cannot be discover'd, even by a judicious Eye, till it is try'd; and this may prevent its going as it ought. That Plow which will not go well with one Coulter, certainly would not with four; but it would be very unjust to charge upon the Number of the Coulters, what is really the Fault of some Part of the Structure of the Instrument itself, independent of that Addition.

If the Plow goes well with one Coulter, then put in the other three; there is not much Fear but it will also go well with them. If it do not, then let the Position of the three additional Coulters be examin'd; and let it be seen in what that differs from the Rule, laid down here for that Purpose. That it differs in something need not be doubted; for of a Certainty, if they be rightly disposed according to these Directions, the Plow will go well.

To know whether a Plow goes well, examine the Furrow: if that be of an equal Depth on the Right Hand and on the Left; and if the Plow turns it off fairly, it is right. If in the going of the Plow, the Tail of the Share, and the Bottom of the Drock bear against the Bottom of the Furrow; and if it goes easy in the Hand of the Holder, without pressing one Arm more than the other, the Farmer may be assured it is a good one. Such a Plow will go with four Coulters as well as one.



C H A P. XXIX.

Of the Management of a Plow in working.

WHEN the Farmer has got his Plow well made, let him see that he keep it in Order; and that he employ a Man in the working, who is able to manage it as he ought, and who has Honesty enough to take the necessary Care and Pains. The Farmer depends more upon the Integrity and Knowledge of his Plowman, than on the Qualities of any other Servant whatsoever.

The Handles of the Plow being made of that Length

Length we have ordered in the last Chapter, are very useful for the proper guiding of that Instrument; but often the Plowman will cut them shorter to favour his Idleness. When they are shortened, he can bear his whole Weight upon them, and in a Manner ride instead of walking. If he should play this idle Trick with long Handles, his Weight would tilt up the fore End of the Beam, and raise the Share out of the Ground. The keeping the Arms long therefore prevents this negligent Trick, and at the same Time gives him an Opportunity of managing the Plow to the greatest Advantage.

An awkward Plowman will be continually over-setting the two wheeled Plow; but a careful Person who is used to the Management of it, hardly ever meets with such an Accident. The great Danger of over-turning is, at the going out at the Land's End, from one Furrow to another. But the skilful Plowman lifts his Plow a little round, and then holds up the Crow Staves with the End of the Beam, by pressing his Hand hard against the Handle, while the Plow lies down on one Side, till the Horses, the Wheels, and the Body of the Plow come nearly to a Line in the Beginning of the Furrow; and then he lifts up the Plow and goes on.

These little Contrivances are exceedingly useful. They are more easily seen in the Practice, than taught by Words; but what is here said may serve to let the Farmer know when his Plowman manages his Business right, and when he does not; and may assist him in the giving one that is willing Directions.

In the four coultered Plow there is another Inconvenience very likely to happen, but very easily remedy'd: this is, that sometimes the first or left Furrow is apt to come through betwixt the first Coulter and the Sheat, and in this Case it falls upon the Left Hand Side of the Plow.

This, though not of the Consequence of many other Faults, yet is worth preventing, and the more as the Remedy is easy. To this Purpose let the second Coulter stand a little higher than the third; and then the second Furrow, holding the first at its Bottom, will carry it over together with itself, and throw it on the Right Side of the Earth Board.

Let me give the Farmer one Caution farther in this Matter; which is, that in this placing the Coulter, he never sets it so high that it does not cut the Turf through. As to the first Coulter, though it should cut but an Inch or two within the Ground, the Share will break off the first Furrow in raising it up.

If in the Plowing with this four coultered Kind, the Coulters become clogged and loaded with Pieces of the Turf, a Boy should go by the Side with a forked Stick to clean them off from Time to Time, which is done very easily.

The Coulters being disposed exactly as we have described, will have more Space between them above than below; so that this clogging will not happen often, and when it does, the Cleaning is easily performed. The Farmer may always know when he shall have Occasion for a Boy to follow for this Purpose, because it rises not from the Fault of the Plow, but the Nature

of the Ground. This Plow in clear Ground goes as free and clean as any; but when there is a great Quantity of Couch Grass on the Land, its Roots hold the Turf together in such a Manner, that it rises in Pieces, and hangs between. This is the only Occasion on which there is a Need of such Assistance; but if it be not taken Care of, the Load of clogging Matter will fill the Spaces between the Coulters, and raise up the Plow out of its Work.

In the common two Wheel Plow there is a very great Inconvenience too frequent, and of very bad Consequence; this is, the leaving a great Part of the Land unturned from the Shear's Point going too much to the Left. The Consequence of this is, that the Work is done irregularly, and often a great Part of the Ground which is covered by the broken Earth, is whole and untouched, and the Weeds are found afterwards growing upon it. This is a great Fault: it defrauds the Farmer of so much of the Business he engaged should be done; and there is nothing he ought to look into so carefully.

Sometimes he will find it happen from the Imperfection of the Plow itself, and then he is to apply to the Maker. The well going of a Plow principally depends in the placing of the Share rightly upon the Sheat; and in this Case the Remedy must be by an Amendment in that Article. This is the nicest and most difficult Part of the Plowright's Business, and is what the Farmer is most concerned of all other to see done well: it matters not that the Maker can tell him, or shew him it is right as it stands upon the Ground, let him try it in some Work, and never be satisfied with it till it answers its Expectation.

This Fault last named, though it sometimes be owing to the Make of the Plow, yet may also arise only from the Folly of the Plowman's setting it wrong: therefore this should be tried first. His Fault is the setting it so that the Point of the Share turns too much to the Left: in this Case it will always cut crossly, and leave a Part of the Ground untouched, tho' covered by that which has been cut, and is thrown over it.

There is no Part of his Business which the Farmer is more under a Necessity of following with his own Eye than this. His Interest is engaged in the well executing of it, though the Servants is not. It is easy to plow too shallow, or too deep. Where there is a full Soil, the deeper the Plow cuts the better; but where the Soil is shallow, and the Bottom bad, let there be great Care taken that the Clay or whatever other bad Matter it be, shall not be turned up with the Soil. He should himself oversee this that his Plowing may give him all the Advantage, and avoid all the Disadvantage there is in the Condition and Nature of the Ground.

Some Choice is to be made in regard to the Situation, in the Manner, and Course of the Work. When a Land lies upon the Descent of a Hill, let it never be plowed strait up and down, but crosswise. This has a double Advantage: for the Horses are not tired, as they would be with going strait up and down, and the Land also will fare a great deal the better.

tial to the free Growth of Plants is very plain, because it is from the smallest Particles of this Matter that they are nourished, and the breaking of the Land in this Manner is the only Method of giving the Roots a free Passage between them, in their Search of this Nourishment.

On this, which is evident from the preceding Facts and Reasonings, depends the famous System of Horsehoeing Husbandry. But beside these two Articles, of Liberty of spreading the Roots, and a proper Quantity of Nourishment, there are two other, without which Plants cannot thrive, these are a due Degree of Heat and Moisture.

Corn, and the other common Produce of our plowed Land, demands a moderate Degree of each of these, and the Farmer is to guide his Practice throughout in such Manner, as to give them a Supply without giving them Abundance. It will be ask'd, can the Farmer cause Sunshine, or can he call down Rain. Neither: nor do we expect Impossibilities of him, nothing is more easy than what we require him to do, and the Effect shews that it will succeed. We have shewn in our third Book, the Way by which he may defend his Lands from Cold by Fences, and in the Beginning of the present, in what Manner he may keep his Ground moist by Tillage, these Things therefore are in his Power; however little they may seem so to those not acquainted with the Practices of Husbandry, their Reasons, and their Effects.

But as he is to communicate to his Crop all good, so far as he is able, so he is to defend it from all ill: and as in the preceeding Chapters we have shewn how he may give the Advantage, it remains that we shew how he may prevent the Hurt.

Now one of the greatest Misfortunes that can attend a Crop, is too much Wet. This sometimes happens from the Particularity of a Season; but oftner from the Nature of the Land. When the first is the Case, the Farmer's Care must be to find Methods of carrying the Wet off; when the latter, he must employ all his Care to provide against it. Land that is too wet will never produce Corn well, and to prevent the Mischief attending this Condition of the Ground, has been invented the Practice of which we treat in this Chapter, the laying Land in Ridges.

This is a particular Sort of Tillage, and its Effect is greater than those seem to understand who employ it. They use it only to keep their Lands from being too wet, but it has an Effect in regard to the Degree of Heat, not less than with Respect to that of Moisture.

We shall see, upon examining this Practice and its Effects, how well Nature has taught People to use it. We see them in the moderate Soils that are frequent in BUCKINGHAMSHIRE, and elsewhere, frequently lay four Ridges together: in KENT they often lay six, and the lower Parts of ESSEX eight, and in HUNTINGDONSHIRE, upon their wet and stiff Clays, they sow all upon broad Lands, raising the Middle of the Ridges in some Places two Foot and a half higher than the Side Furrows. This at once exposes those tough and clammy Soils to the Sun better than any other Method, and drains them of the abundant Wet.

We have seen that Calcination by Fire reduces Clay to a good and rich Mould, and that the draining it of abundant Moisture always abates its Toughness. Now these are the Effects of dressing such Land in this Manner: and in order to have the full Effect of the Practice, let the Farmer take Care to make the Ridges run East and West, where the Situation will allow it, because in this Case the Sun gets at every Part of them the better; and in order to promote farther the other good Effect of draining, let him take Care always to keep the Furrows that are left, open and clean scowered. By this Means they will serve to carry off the abundant Moisture; and to give it a free Discharge from the Ground, Drains must be made in the lowest Places, that may run well into one another. This is so essential a Practice, that when the Plow will not make them deep enough, it should be done by hand with the Spade; and the Earth that is taken out should, in this Case, be carry'd to a Distance, that it may not be trampled in again.

The chief Design of laying Land in Ridges is draining of it, and making the Corn grow properly dry: but we see that by a proper Management it may be made to extend its Benefits farther. In this Case, of a clayey Soil laid in Ridges open to the East and West, where the Situation is such as to allow it without other Damage, the Sun acts in a double Way upon the Soil, not only giving it Warmth, when the abundant cold Moisture is taken away, but by a gentle Calcination of the Surface, it reduces that superficial Part to a State of greater Perfection, and to a Kind of Manure for the rest.

We have seen that the Effect of the Sun and Air is a slow Calcination; that this does gradually what a Fire does hastily, this has been shewn in its Effects on Shells, which whither they remain on the Sea Shore, or are scatter'd on Lands as a Manure, become, in time, white and brittle, and in all Respects resemble such as have been calcin'd in a Fire.

The natural Defects of many Lands, otherwise useful and good, are a too great Degree of Moisture, and a Defect of Heat. The latter naturally arises from the former, for a Quantity of Water detained among Clay, or any other tough Earth, becomes cold, and chills the Plants that are laid upon it. The great Remedy, in this Case, is the laying the Land in Ridges; and that the careful Husbandman may be sure to know when this is requir'd, as well as how to do it, we shall give him the following Hints.

In many Places the Abundance of Moisture, and the Coldness of the Soil, are very obvious to the Eye: the Land is clammy and wet the greatest Part of the Year, and he will know of himself that this is not a Condition in which it will bear Crops to any Advantage. This obvious and plain Discovery of the Fault is most constant where the Occasion of it lies high, where the Clay makes the whole Soil. But the same Fault may be in the Ground where the Occasion of it lies somewhat deeper, and though it is not perceiv'd by the Eye, the Effects may be found the same. Thus when a Land has a thin, light, and loose Soil at the Top, and a tough Clay at a small

Depth under it, the Wet will run through the light Earth presently; but it will lodge on the Clay underneath for a Continuance. This is a very deceitful Kind of Land. It will look dry, when it is, in reality, very wet below; and this in the very Place where the Roots find their Nourishment, for they do not spread much just at the Surface, but mostly at some such little Depth below.

As the other wet Lands shew themselves to the Eye in their own Condition, the Fault of these is to be seen in the Growth of the Crop. When it is in a great Degree it discovers itself to the Senses on every opening of the Ground, but even in a less it is capable of doing great Hurt, and it is then known by the Aspect of the Corn or other Growths. If the Leaves look sickly and yellow, if they droop, and the Stalk rises slowly, we may be sure this is the Fault of the Soil, and that it is owing to wet and cold: we may be certain that however dry and fair the Land may seem just on the Surface, it is wet at a small Depth.

When the Cause of the Disease is known, the Remedy is easy, it is nothing more than this laying up the Land in Ridges. If the Descent of a Hill do not prevent, let these be open to the Sun, by being laid East and West; and by this Means, while the Water is carry'd off by the Disposition of the Ground, the Sun will calcine; and every Day improve the clayey Matter that lies on the Surface, from the Effect of plowing.

The Water naturally, in this Case, runs off the Ridges into the Furrows, and is thence, as before directed, to be carry'd by proper Drains out of the Land, to some River or other Conveyance.

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C H A P. XXXII.

Of the wet Land on Hills.

WE have shewn that the very Intent of laying Land in Ridges, is to drain it of abundant Wet, the Consequence of which is Cold: and as there are more Kind of Lands than one that are apt to be wet, and those, according to their Differences of Condition and Situation, may require some Variation in the Manner of applying the Remedy, it will be useful to consider them separately.

The two principal Kinds of Land that are liable to be chill'd by Wet, are those on Hills where there is a Bed of Clay under the Mould; and those in level Grounds, which consist of a very deep and very stiff Soil. The former Kind are to be treated of in this Chapter.

The Occasion of the Mischief in these is very obvious, the Rains fall upon this Ground, and soaking through the Mould, are detain'd by the Clay. They cannot enter the Clay, and therefore they spread themselves among the Mould above; and the Mould below stopping it in its Descent, and more Water falling above, the whole approaches to the Nature of a Bog; the Ground being soft, pappy, and rais'd above the natural Level by the Water spread among it.

When this is the Case in a very great Degree, no Method of plowing can be sufficiently effectual to remedy it. In this Case Trenches must be cut a-cross with a Descent, to carry the Water off. And they may be fill'd up with rough Stones, and cover'd over with Earth again, so that all may be wrought as a level Surface: Reason points out this Remedy, but it is often too expensive, and such Lands, when too wet and too difficult of Remedy, are to be neglected: we therefore have named these only to shew, that they are not to be attempted by ridging; for nothing disheartens a Husbandman so much as undertaking what he afterwards finds cannot be done.

When the Wet is in a considerably large Degree, it may be discharg'd by laying the Land properly in Ridges, though not where it is thus very abundant: therefore let the Farmer first examine carefully whether the State of the Ground will or will not admit a Cure; if he thinks it will, this is the Manner in which he is to set about it.

Let him plow the Land in Ridges, almost cross-wise of the Hill, but a little oblique or slanting: for if they be perfectly carry'd a-cross, or quite strait down, they will neither Way do. When they are thus carried cross-wise, but a little diagonally, their parting Furrows lying open, will each serve as a Drain to the Ridge next below it: for when the Plow has made the Bottom of these nearly horizontal Furrows a few Inches deeper than the Surface of the Clay, the Water will naturally and securely run to their Ends, without rising into the Mould, provided no Part of the Furrows be lower than their Ends.

We have said these parting Furrows and their Ridges, should always be made a little obliquely; and this Obliquity or slanting should be more or less, according to the Form and Declivity of the Hill.

We are to consider that there are two Ways in which Water that falls upon an Hill runs off. The one is on the Surface, and the other is between the Mould that makes the Soil, and the Clay that makes the Bed under it. 'Tis this second Course, or the running of the Water upon the Bed of Clay, and under the Mould, that we are to consider on these Occasions; for on that depends the Damage we propose to rectify. This is the Source of what we have directed, as to the Disposition of the Ridges; and it will be found, on the most careful Examination, that as only this Method of ridging could keep that Part of the Soil dry, so there is no Direction in which they could run, that will so well secure the Advantage, as the carrying them with this Slant cross-wise of the Hill.

In this Case the Consideration of laying the Ridges East and West, must give Way to this cross Direction with respect to the Descent of the Hill. We have mentioned, under that Head, that there were Exceptions; this is the principal; and in this, as in all other Cases, the greater Convenience is to be consulted, and the lesser is to give Place to it.

The Farmer who shall make himself perfect Master of his Business, will often find two Things would be right, both of which together are impracticable:

practicable: he must, in this Case, content himself with taking the best.

The Way of working on this Occasion is to plow the Ridges in Paces, without throwing any Earth into the Trenches. In this Case the Ridges will be plain at the Top; and the Rain Water will speedily run downward to the next Trench, and thence to the head Land, and so out of the Field.

These are easy and plain Directions, and the Success of them is certain; it not only is plain to Reason, but is vouched by Experience; and yet a great deal of Land that might be saved by it, is left to produce little or nothing by the common Treatment.

C H A P. XXXIII.

Of the wet Land that lies level.

THIS is the second Kind of Land that is liable to be wet and cold, and that may be greatly mended by the Tillage in Ridges. Sometimes there are Springs on the Hills that add to the Quantity of Water which they have from Rains, and this makes the Cure more difficult: in these deep, wet, and stiff Soils that lie on a level, the Cause is always to be found in the Water that falls by Rain alone. But this will sometimes put the Land into as bad a Condition as if there were Springs in many Places.

When a deep stiff Soil lies flat, and is plow'd sometimes one Way, and sometimes another by cross Plowing, it will hold Water a long Time. By that Misfortune the Plow is kept out two or three Weeks longer than if it were in round Ridges. Sometimes its Flatness keeps it from drying till the Season of Plowing and Sowing too are lost.

The Farmers are backward in Plowing the hilly wet Grounds in Ridges, and more in this. They say it prevents the Benefit of cross Plowing, which they count as a great Advantage, and they think they lose a Part of their Ground by the open Furrows, which they otherwise fill up with Harrows. But these are Mistakes and Prejudices, of which it becomes us to set the practical Farmer right; for on such Notions which he receives upon Credit, without being at the Pains of examining whether they be true or false, depend the greatest Part of his Disappointments and Losses. Cross Plowing is oftener a Hurt than a Benefit to Land: this is certain, and any one who is accustomed to Farming, and will examine what he from Time to Time sees, instead of taking all Things upon Trust, will find it so in Experience. This therefore is an Objection arising only from Prejudice in Favour of common Practice, and common Opinion: the other is entirely an Error; for, instead of losing any Ground by Ridges, it is possible to gain some. In the most simple and common Practice none is lost; and managing wisely and properly, much may be gained.

Ground is gained for the Farmer's Purpose when its Surface is increased, and is capable of bearing more Corn; and this is plainly practicable in the Plowing in Ridges. If in this Custom of

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Plowing we allow two Foot in sixteen for an empty Furrow, still the Difference of Surface between the rest as it lay flat, and as it is plowed into Ridges, is much greater in his Favour than this Proportion is in Loss of Quantity. All the Surface thus raised in Ridges is capable of bearing Corn, and therefore it is so much Ground gained to the Husbandman.

This is the plain and absolute Fact; and this is all that it concerns the Farmer to know. Many Arguments have been raised against it, but they are frivolous or false. We name them only that the Reader used to see Things thus canvassed, may not think we overlooked them. To the practical Husbandman they are of no Importance, for they have no real Weight; and to the Curious it may be enough to say, that the Doctrine of the perpendicular Growth of Plants, on which all their Cavils are founded, is in itself erroneous and false.

It is certain the Surface of a Field measures more in Quantity when in Ridges than when flat; and it is equally certain that all its Surface, the empty Furrows excepted, is capable of bearing Corn. This is a short State of the Case. These empty Furrows have been taken into the Computation, and the Difference is in Favour of the Land in Ridges. No Sophistry can get the better of so plain a Fact; and it is upon this Fact, and the evident Advantage that wet and cold Lands receive from this Kind of Tillage, that we recommend to the Farmer the Tilling his stiff, cold, moist, and flat Lands, in this Method of plowing in Ridges.

The Success and Quantity of a Crop does not depend upon the Space there is for the Corn to stand in, but on the Quantity of Earth there is for its Roots to spread in for getting of Nourishment: now we have shewn that the Roots of Corn spread near the Surface, or at a small Depth under it; and we find from this alone, that the Increase of the Surface of Ground in measure, is in Reality an Increase of it in Quantity, so far as the Growth of these Plants, whose Roots spread at a small Depth under the Surface, are concerned.

The Increase of Ground therefore is a certain and a considerable Advantage obtained from the plowing in Ridges, but it is not the only Benefit attending that Method. Beside the great Purpose which is answer'd by it in keeping the Land warm and dry, the Ridges are a Shelter for one another, and a Defence against cold Winds; and when the Field has been exhausted by frequent sowing, the Ridges may be made just where the Furrows were, and there will be all the Advantage of fresh Ground.

Having explained the Benefits of Ridges, and the Reasons on which they are supported, we shall proceed to give the practical Farmer two or three Cautions about the making of them, that he may be able to do what we have advised to the best Advantage.

In a deep Soil let the Ridges be made narrower, and in the shallower let them be broader. Let him overlook the Work, and have a particular Regard upon descending or slanting Grounds, to the Direction and Course of the Furrows; and if he intend to follow the Horse-

hoeing Method, which we shall describe hereafter, and which in a moderate and proper Use, has great Advantages, he should rather chuse a Land that is dry in its own Nature, than one that wants this Assistance of being laid up in Ridges, for they are often an Interruption to that Practice.

The Furrows are to be deep or shallow, according to the Depth or Shallowness of the Soil. When these Lands are improved by this Method of laying them in Ridges, Wheat and Rye need not be sown upon them so early as they are in their cold and wet natural State; but they must still, with all this Improvement, be sown earlier on them than on Lands that are naturally dry, and warm. For Summer Corn, on the contrary, the cold Land must be sown last.

In many of the Western Counties they sow all their Barley with a broad Cast upon broad Ridges; and in KENT and ESSEX they frequently sow it on narrow Ridges like Wheat: in this Case there are to be two small Harrows used, one of which is to take each Side of the Ridge, and this Method is then very successful. They roll it with a Roller of a particular Structure, called a Belly Roll, that goes between the Ridges.



C H A P. XXXIV.

Of the Advantage of Tillage by the four coulter'd Plow.

WE have described in a preceding Chapter, the Make and Construction of that excellent Instrument, the four coulter'd Plow, in so precise and punctual a Manner, that the careful Reader, altho' he have never seen one, cannot be at a Loss to order the making of it; and having now treated so far of the Nature and Advantages of Plowing in general, we shall be understood with Ease in recounting the Benefits that attend this particular Method.

Nothing gives the Husbandman more Trouble than the conquering a strong Turf; and there is no Method whatsoever by which he can effect this so well, as by the four coulter'd Plow. The richest Land is subject most of all to this tough Head; and the deeper the Soil, the larger must necessarily be the Furrows; for if they be too small, a great Part of the Mould will be left unmoved, and so lost to the present Use of the Farmer. A narrow Furrow cannot be plowed deep, because the Plow will continually slip out from the hard Land toward the Right Hand, unless the rising Furrow be of sufficient Weight to press the Plow toward the Left, and keep it in the Work. The deeper the Farmer goes, the greater Weight is required to press the Plow: so that the deeper the Land is into the larger Furrows it must be plow'd. If the Work be done with a common Plow of the very best Invention, for a Plow with one Coulter is not capable of doing it otherwise. The Consequence of this is, that in a very strong Land that has rested some Time, it is the Work of many Years to get into a good Tith. This the Farmer who has had Land in such Condition upon his Hands, has never failed to find to his great

Trouble, and his Heart will go with me as he reads this Account. The Price of this laborious and repeated Tillage often comes so high, that it reduces the Profit of rich Land below that of poor.

It is a common Pretence among the Plowmen, that when they have slightly, and imperfectly broke up a Land at the first Plowing, they will go deeper, and do it better the second; but they know they promise what cannot be performed. It is of the utmost Importance to the Farmer to cut and divide such Ground in the most perfect Manner: we see that the common Plow cannot do it well, and seldom does it otherwise than by halves; nor is there any other Remedy that is not too expensive for the possible Profit. For this Reason the four coulter'd Plow is proposed to him most of all Things on this Occasion. It is an Instrument useful on many others, but it was invented for this, and will not fail to answer to his perfect Satisfaction. This Land must not be plowed a second Time in wet Weather, for that will make the Weeds grow; and if it be done in dry, the Plow will never go deeper than it did at first.

Therefore the common Method of Tillage does not answer to any tolerable Advantage on such Land. The Farmer sees this, but he knows not how to help himself. If he attempts it by the Breast Plow, the Work is very expensive; and if there be many Stones in the Soil, as is often the Case in these Lands, it is altogether impracticable. If the Turf be pared off very thin with a Breast Plow, and laid to rot, before it be plowed in, in the common Way, this may do; but if the Season be wet, it will grow instead of rotting; so that in most Cases this is a very hazardous Undertaking, and in many it is not at all practicable.

Even digging up the Turf with Spades would not answer in this Ground, unless it were done extremely thin, which will never be procured to be faithfully executed at any Expence. As the Spring is usually wet, there is Danger in cutting up the Turf for rotting any Way at that Time, for Fear of its growing; and if it be deferred till Summer, the Plowing afterwards in dry Weather on such a Soil will be very inconvenient, and the Wheat Season probably lost.

In these Exigencies which happen very frequently, and most of all upon the richest Land; if the Farmer will venture upon the Breast Plow, or that slight Plowing which only cuts off the Turf, let him do it not in the common Way, by the Force of a Man's Breast and Arms pushing the Plow before him; but let him have Recourse to that particular Kind of Plow, which we have directed to be made for the cutting up the Turf for Burnbaiting, and the Roller described with it. These two Instruments will give him an Opportunity of getting up the Turf, and of cutting it to Pieces in a much more easy and expeditious Method than the common Way; but yet this is by no Means comparable to the doing it at once by the four coulter'd Plow.

In the common Way of Plowing, this Kind of Land cannot be cut in Furrows of less than ten Inches broad; and to this is owing all the

Disadvantage : to this it is owing that the Land is several Years before it can be sufficiently broke and divided, and that the Grass and Weeds grow with the Corn. But with the four coulter'd Plow this ten Inch Furrow is cut into four equal Parts, so that there is no Part above two Inches and a half broad, and this is done thoroughly; for the Coulters cut thus to the whole Depth of the Soil, tho' it be fifteen or sixteen Inches.

What a prodigious Advantage! and it is done as easy as by the common Method of Plowing: for before the Furrow is raised by the Share, it lies fast, and makes an equal Resistance against all the Coulters, so that they all pierce quite through it.

The dividing the Furrows length-wise into four Parts, is not all the Advantage that is gained by working it with the four coultered Plow. This would in a Manner make one plowing answer the Purpose of four good ones: but beside this, it is a natural Consequence that the Furrow is divided cross-wise; for the Ground-wrist in this Method presses and breaks the Right Hand Quarter; and the other three Quarters, as they must necessarily bend in coming over the Earth Board, break also in falling into many small Pieces.

Nothing of this happens in the working by the common Plow, where the Furrow being of such a Thickness as very well to keep entire; when the Soil is any thing strong, falls whole. Counting therefore the first Division made by the Coulters, and the second by the natural and necessary breaking, there is no Question but the four coulter'd Plow does at once Plowing, divide the Soil more than twenty Times as much as the common Plow. It has therefore twenty Times the Use; and it does the Farmer twenty Times the Service: we see it is very easily practicable, and he who shall try it will find, that far from our making the most of what it will do, very frequently the Advantage is much greater. Frequently when the Earth is of a right Temper, neither too dry nor too wet, the Earth Board in turning the Furrows off will crumble them to Pieces: they shall fall into a Kind of Dust, and hardly such a Thing as a Lump of any Size will remain in the Field.

We have shewn already in the first Part of this Book, that the breaking and dividing the Earth into small Particles, is the great Thing in which the Benefit of Tillage consists; and it is very evident from the Effects of this Way of Tilling, that one or two common slight Plowings after this one Plowing with the four coultered Kind, will reduce the whole Soil in a Manner to Dust. The whole Depth of the Soil is directly brought into Tilth; and the Turf being cut into these small Pieces, rots and decays presently, adding a Kind of Manure to the Richness given by this breaking of the Soil.

The greatest Use of this Plow is in the conquering and reducing a strong Turf; this scarce any other Instrument of Husbandry will do without a great deal of Time, whereas the present does it at once. When the Turf is cut up large, as it must be by the common Plow, the Pieces lie hollow, and as the Air can come to them, they grow; but being cut into such small Pieces

by this Plow, they lie close and rot, because they have not Air for growing. The Length of the Roots is also a great Disadvantage in the common Way of Plowing; for they will shoot from the Joints, when they are of any good Length, as that Sort of Tillage always leaves them: but in the Use of the four coultered Plow, they are not only torn up, but cut to Pieces; and those so short, that if they are buried they rot; and if exposed on the Surface, they shrivel and wither, so that either Way they perish.

Any Weather will do for plowing with this Instrument, in which a Plow can be used, but in general wet is best; it may be used when the Ground is ever so moist, provided the Horses are not mir'd in drawing it: and there is no Way in bringing Land into Tilth in so short a Time, or with so little Expence as by the Use of it. No Farmer ought to be without a Plow of this Kind, who would be sure that his Land shall never be out of Tilth.

As we have mentioned the great Advantages of this Instrument, we shall name also its Inconveniencies, for it is not without these, tho' they are nothing in Comparison of the other. The four Coulter Plow is harder to draw than the common Wheel Plow, and its Beam being longer it lies farther behind, and comes heavier after the Horses; its whole Weight also, the Strength and Thickness of the several Parts being proportion'd to the Length, is considerably greater than that of the common Plow.

For this Reason it will always be proper to add one Horse to the usual Number for the drawing of this Plow; or if a stronger Team be employed, the Difference will not be so much felt. We give the Farmer this Advice that he may know what he has to do, and set out right; but it would be idle to name it as a Counter-balance to those great Advantages which we have shewn attend the Use of this Instrument.

The Difference from the Weight of this Plow, and the Length of the Beam, is not so great but that it is near as easily drawn in moist Weather, as the common Plow is in dry Weather on the same Ground, and at the same Depth. Indeed one great Reason of its following heavily is the Depth to which it cuts; and this is so great a Benefit, that it would be very idle in the Farmer to grudge the adding one Horse to his Team for obtaining it: the four Coulter Plow will, upon Occasion, cut two Spits deep, as before observed, which is a prodigious Advantage; but when this is not required, it will cut as shallow as any other Kind, and then the Weight is very little felt.

The cutting the Furrow into four Parts, is something, for adding to the pull of the Horses, but it is not much. When the Ground is in a right Condition, and the Coulters are in good Order, they cut thro' very easily; and the Furrows being thus divided, rise so much the more freely upon the Share and Earth Board, than they would do if whole; that perhaps as much is gained in the Ease of working this Way, as is lost the other.

Plows with two Coulters instead of one have been used in different Places, and always with the

the greatest Success; the adding a third and a fourth Coulter, must of Necessity increase the Advantage; and upon the Rules, Descriptions, and Figures we have given of the several Parts, and the putting them together into one whole and regular Instrument, we hope the Farmer will not fail of having it done to his Satisfaction. The Difficulty is not great, but the People who make Plows are very ignorant; nothing could have brought the Plow with two Coulters into Disuse, but the bad Way of making it: and nothing but the properly putting together this new Kind can be wanting to the bringing it into general Favour.



C H A P. XXXV.

Of the general Benefits and Advantages of Plowing.

WE have considered Plowing as the capital Operation of the Husbandman's Profession, and we have therefore treated it very much at large with Respect to the Structure and Make of the Instruments of that Name, and Methods of using them on particular Occasions: now that we may leave no useful Part of that Operation neglected, we shall in this concluding Chapter on that Article, lay down whatsoever of general Matter it may be fit that the practical Husbandman retain in his Memory.

The plowing of Fallows is a great Advantage to them; this is the Sense of all Mankind, and Tenants are bound by Articles to perform it at certain stated Periods for the Benefit of the Landlord. What is thus required by the Owner, will be also, at proper Seasons, a Benefit to the Person who rents the Ground; and in general the Farmer may be assured of this, that the Expence he employs in Plowing, will bring him in many Times the Sum in the Produce. The old Authors could say universally, that the Advantage of Fallowing consisted in two Things; which were the exposing the Soil more to the Sun and Air by turning it up in Ridges, and the breaking the Lumps and Clots of Earth by frequent stirring and turning. This is the old Doctrine, it is found in these Words in MARKHAM, and that innumerable Set of Writers who have copied from him. This is the Principle upon which the Horsehoeing Husbandry is established: therefore it is idle to rail at it, or to consider it as a new Doctrine.

Mr. TULL was a Person of great Industry and great Sagacity. He read carefully what was written on Husbandry, and he adopted the best Things; and improved upon them. His System is new, but the Foundation of it is, as we have shewn, in all Respects as old as any Thing we know of Husbandry. It is unjust to accuse it of Novelty and Whim, the Principles on which it is established are old and true.

The plowing of Fallows, beside breaking and exposing the Ground to the Seasons, kills the Weeds; turning up their Roots to be wither'd by the Air, and oversetting the Seed Shoots be-

fore they are of such Growth as to exhaust the Land.

A great Caution the Farmer is to take is this, that he harrows no more down in Winter than he shall quickly be able to raise up again in Ridges; for if it get wet by Rain while it lies flat it will grow poachy, and very difficult of plowing afterwards. This is the Case most of all in wet Lands, and these frequently breed such Quantity of Weeds upon it, that they exhaust a great deal of Nourishment while it is expected to be recruiting. The best Way is to harrow only in an Afternoon, and to harrow no more than is to be plowed next Morning; or to harrow early in the Morning, what is to be plowed in a few Hours afterwards.

If the preceding Summer have been wet, the Land will naturally be full of Weeds: in this Case let the Farmer plow it up early in Winter to kill this useless Growth, and to mellow the Soil.

The antient Writers speak of a Plow that was managed by one Man only, who could very well both guide and drive. Such a Kind may be made upon the one wheeled Plan; it may be light and small, a single Horse may draw it, and a single Person very well manage it: but this tho' pretty and familiar, will be of a limited Use, for it is fit only for a light and well wrought Soil, and is to be used only in sowing Time. Such a one, however, it may very well be worth the Farmer's while to have when he has such Land, for in those Fields in a moist Season, it will answer excellently.

They use at this Time in some Parts of the West of ENGLAND, a Plow that has neither Wheel nor Foot. It is made upon the Principle delivered in Mr. BLITH's Husbandry, but it does not answer quite so well as he seemed to think it would. The Use of it is confined to easy Ground that is even, for where there are Roots or Irregularities, it does very poorly.

We name all these Particulars that the Farmer may take his Choice among them, suiting the Kind to the Use; for we have shewn him the Uses and Disadvantages of all the Sorts. These two last we have named in this Place, because tho' good in particular Places, and on particular Occasions, they are not to be rely'd upon in the general Practice.

There have been Proposals by Dr. PRIOR and others, for digging Ground for Corn with the Spade as we do for Flowers, and managing a Field as we do a Garden. There is no Doubt of the Success of this, but the Expence must be monstrously great; and by the Methods already directed, and to be added when we come to the Article of Hoeing, according to the new Method, the same Advantage may be obtained with more Ease, and at less Expence.

There is also another Method to be named on this Occasion, in which the Plow and Spade are employ'd together, this is called Plow-trenching. It is used in deep and light Land. One Furrow is plow'd, and half a Dozen Labourers following at proper Distances one from another with Spades, are to dig in the Furrow, and throw up the Earth on the Glebe turned by the Plow. While the Diggers are at this Employment,

ployment, the Plow is to turn up another Furrow at a reasonable Distance; after which the Labourers are to do the same there, while the Plow is turning the upper Earth of another Furrow into the former Trench.

The Principle upon which this Practice is founded is very right, but the Method wherein it is done is in the highest Degree awkward. We have named it that the Reader may know what Plow-trenching means; but we have delivered Methods of answering the same Purpose in so much easier a Manner, and at so much smaller an Expence, that this will never be found worth any Persons while to think upon.



C H A P. XXXVI.

Of the Benefit of converting Pasture into Arable Land, and of continued plowing.

WE have mentioned occasionally before, the Propriety there may be in changing Pasture into Arable Land, in order to keep up the Proportion of the two: but this is not the only Thing that may lead to such Practice. Pastures on certain Soils are very apt to spoil of themselves, and that often when they are rich as well as when they are poor.

The Growth of Moss is a great Enemy to good Pasturage, and frequently Lands are so over-run by it, as to be in a Manner spoil'd for Grass. In this Case, if the Methods we have laid down in treating of Manures prove insufficient for the killing this pernicious Matter, the Farmer must, at all Adventures, have Recourse to plowing. That always succeeds, and there is no Way of destroying Moss like it. After a few Crops this Land may be laid down for Grass again, and will succeed excellently.

In all barren and neglected Land, plowing is the great and immediate Method of Improvement. The breaking and dividing of the Soil give it Fertility, as has been seen already, and at the same Time it kills the Weeds, that never fail to grow in Abundance on such Places, by rearing up and exposing their Roots.

Sometimes it will happen that a wet Summer will fill a Land with Weeds after what was intended for the last plowing in the Fallow, by which it was preparing for Barley; in this Case it must have another stirring during the Winter, in order to kill them. Some content themselves, in this Case, to tear them up with a Harrow; but plowing is much better, and it is then to be laid up high, that it may keep dry the Remainder of the Season, and by the Effects of the Frosts and Air after this, it will be excellently prepar'd for the Seed Time in Spring.

The common Method of Farming is at present by the Use of Tillage and Manures jointly, and it comes at a very moderate Expence. Supposing the Land to be out of Heart, and to take in the whole ordinary Compass of the Business it is this. In April, to begin the Account no sooner, they lay on twenty Load of Dung to an Acre, this costs about a Shilling a Load; the Ground being already in Tillage, there will re-

quire beside the Dunging, two Plowings to prepare it for Wheat. Each of these Plowings will be about four Shillings an Acre Expence, the Land will be then ready for Wheat in the Beginning of OCTOBER; the Seed will cost about five Shillings a Bushel, and about two Bushels will be requir'd to an Acre: the weeding, reaping, and binding, will afterwards cost about five Shillings an Acre more: and the innings of the Harvest, and repair of Fences, may be set at about six Shillings an Acre: the Price of thrashing is according to the Richness of the Crop, for the Labourer is paid by the Bushel. Here is all the Expence, and all the Trouble, and the Harvest, at a moderate Computation, yields thirty Bushels of Wheat an Acre.

After this, without the fresh Expence of dunging, the Land will very well bear two Crops more, one of Barley, and another of Pease, or the like.

These Crops are of less Value, but then they come at a less Expence. Barley is mowed instead of reaping, so that the great Charge in that Article is sav'd; and Pease being cheaper in the Seed, and requiring to have the Ground but once plowed, come more reasonably yet.

Seven Shillings an Acre is sav'd in the Crop of Barley, and thirteen Shillings in that of the Pease, not counting the saving of Dung, so that the Charge of these Crops is much less than that of the Wheat, as well as the Price in the Produce.

This is all that the Country Farmer in general knows of the Business of Husbandry, and thus he practises it. Yet even this Way the Practice is such, that he can live and lay up some Money. The Expence of an Acre of Ground for the three Crops, taking in every Article, is about five Pounds, thirteen Shillings, reckoning at the highest; and the Produce of the three, computing in the most moderate Way, is about eight Pounds.

This Account may tempt any one to look upon Husbandry as a profitable Occupation; but when we come to the Practice of it upon the Rules laid down in this Treatise, as an intelligent Person will put them in Use on every Article, we shall find that the Produce of Land, where the most Expence is employ'd upon it, instead of being three or four times equal to the Charge, is six, seven or eight Times, and often much more.

This may tempt many into the Profession, who have Genius capable of improving it, which will be an Advantage not to themselves alone, but the Kingdom; and it may shew those who are employed in it already, how extremely it will be worth their while to study the Rules and Nature of its Operations more deeply, as every Part of their additional Knowledge will be an Addition to their Income.

Having observed thus much in general, as a Conclusion of what we had to say on that great Article Plowing, we shall now come to the Consideration of those other Operations which are us'd to assist that original Device in the Improvement of Land by Tillage.



C H A P. XXXVII.

Of Harrowing.

THE Husbandman understands that the great Purpose of Tillage is to break the Earth into small Pieces. He sees how the Plow begins this Work; cutting it up from some Depth, and throwing it by, in Quantities more or less broken, according to the Nature of the Soil and the Form of the Plow: but though this is a very material Part, it is not all that is to be done in the preparing Soils for Corn. The Harrow and other Instruments are to follow, whose Use is to break and divide the Furrows still more.

The harrowing is the Operation that follows that of plowing, and therefore is proper to be considered next after that.

In the old Husbandry they employed Men to follow the Plow with Instruments they call'd Hacks, these were a Kind of Hoes, but stronger in the Handle than those Instruments, and hollow in the Blade, which was well steel'd.

These People, whom from the Instruments they us'd, they call'd Hackers, were to follow the first plowing, and to cut and hack the larger Lumps to Pieces, and after these followed the harrowing. But the present Practice having greatly improved the Plow, there is no farther Need of that Instrument or that expensive Manual Labour, but the next Operation to plowing is the harrowing.

This is done by an Instrument armed with Iron Points, which being drawn over the Ground, tears up the Lumps left unbroken by the Plow, and breaks them to Pieces.

The Harrow is drawn by Horses, and according to its Form requires more of them or fewer, and does more or less Service, but in general it breaks the Ground, and brings up a great deal of good Mould.

Various Methods are used as to the Article of sowing, according to the different Practice of Husbandmen in different Places, and with respect to the Kinds of the Crop, all which are to come hereafter into Consideration. But here it may be proper to observe in general, that the Harrow, besides its Use already named in breaking the Ground, has another, which is the covering of the Seed.

It is repeated one or more Times, for the sole Purpose of breaking and dividing the Clods, and when the Corn is sown upon the Land thus till'd, or otherwise, the Harrows are to be drawn over it again, to cover the Seed: this must be done with Care, and it answers a double Purpose; for beside the covering the Seed, it breaks the Clods once again, and scatters a fine Dust over the Seeds, which is of the greatest Service in their first Growth.

We have seen that the Plow answers to the Purpose of the Spade in Gardening; and in the same Manner the Harrow serves in the Place of the Rake. The Plow is a Spade drawn by Horses, and the Harrow is many Rakes fastened together, and worked in the same Manner.

The lighter and looser the Earth, the more completely the Plow breaks it, and the less Need there is of the Harrow; but there is no Ground whatsoever that will not be the better for the harrowing, which covers the Seed. When this is omitted it is thrown among loose Clods of Earth. It is left in a great Degree naked, and is ready for all Kinds of Vermine that devour it; and when it shoots has neither fine Mould about it, nor is able to penetrate these tough Lumps. It languishes therefore in a Soil that would, in proper Order, be very well able to support and nourish it, and this proper Condition will be given it by the Harrow.

But let the Husbandman, while he makes himself sensible of the Advantages and Benefit of harrowing, be cautious that he do not expect too much from it, or depend upon it in Cases where he should have Recourse to more powerful Methods of breaking the Ground. This is a Caution the more necessary, because it is an Error that the present Farmers very frequently run into. They often neglect to give their Land a due plowing, trusting to the Harrow to make it fine. When they have thrown in their Seed they go over it with a Harrow, and being sensible that the Clods of Earth must be broken, and that they have not done this sufficiently with the Plow, when they see once or twice harrowing does not effect it, they go over the Ground again and again, till the Feet of the Horses have trod the Soil into a Hardness that is very unfit for the Growth of any thing.

There are Soils in which treading, at a proper Season, is serviceable to give them a Firmness, which they naturally want, but in others nothing is more destructive.



C H A P. XXXVIII.

Of the various Kinds of Harrows.

THE Harrow, as it follows the Plow in Use, so in all Probability was the Instrument next invented after it. Like the Rest it was clumsy and inconvenient in its first Contrivance; and has been, from time to time, improved more and more, by the Ingenuity of Husbandmen. We shall consider it under the Forms it has got in these several Alterations, and shew its Use in the plainest and in the most perfect State.

The common Harrow is an Instrument too well known to need much Description, it consists of cross Beams and Iron Spikes; and all that we shall advise the Farmer respecting it is, that he have it made firm and solid, for no Instrument in all his Profession suffers more by being made slight than this. Let him see that the Spikes, or Tines, are large and well fix'd, and in the working let him have an Eye that it go evenly over the Ground.

The great Harrow differs from this principally in its Bulk, and the Solidity of its Structure. It is a stouter Instrument, and every way better fitted for Service. It consists of eight Beams, disposed cross-wise, as in the common Harrow. These are seven Foot long, and four Inches and a half square. The Iron Spikes, or Tines, are like

like the Wood-work large and massy; they are twice as thick, and once and a half as long as those of the common Harrow. The Wood-work of this Harrow should be Ash, and a good Workman must be employed; for if it be not framed very well together, it will tear itself to Pieces presently in the working. The Joints of the Woodwork must be all firm, and the Tines fixed in the most secure Manner; and then it becomes a very serviceable Instrument. The Tines in this great Harrow are to be placed at the same Distance as in the common Kind.

The Use of this Harrow is for breaking the Ground, not for covering the Seed; for that is to be done in the same Field with the lighter Harrow. This requires commonly three Horses to draw it: and in very strong Lands sometimes more; but by its Weight, and the Length of its Tines, it tears away very deep, and has a Force to break the Clods much better than the common Kind. This is fittest for the stubbornest and hardest Kinds of Land; and is there of such Service, that the Farmers think, its Effect equal to a slight Plowing.

It may be dangerous for the Husbandman to trust to it in this Respect so far as to neglect the necessary Plowings; for at the best it is not equal to that Operation; but following it, and in some Lands following the Roller, it will be found of vast Advantage.

The Drag is an Instrument of the same Kind with the Harrow, and differs in nothing from the great Harrow last described, but in the Weight and in the Awkwardness of the Contrivance. The great Harrow is sufficient for all Purposes of tearing up the Ground in that Manner, therefore this Invention was unnecessary.

The Drag is composed of eight Beams, each eight Foot long, and of a great Thickness; they are placed crosswise, but at Distances much larger than in the great Harrow; and the Spikes which are very thick and long, stand also at greater Intervals: this unwieldy Instrument cannot be managed with less than four Horses, and sometimes they add a fifth, the four in Couples and the odd one alone in Front. In this Way the Thing is lugged along very unevenly and irregularly; it digs deep, and tears up a great deal, but the Distance between the Tines makes it leave a great deal untouched, and a great many Clods unbroken.

The principal Use that is made of these Drags, is in the preparing of Land newly plowed up from Sward. When the Soil in such Cases is rich, and the Turf tough, there is nothing more difficult than the getting such Land into Tillth. We have already, under the Article of Plowing, explained the Difficulties of this Article in the Husbandman's Business, and recommended the doing it by Means of the four coultered Plow. As we have here mentioned the Use of a Drag as being common to this Purpose, we must caution the prudent Reader from being misled by the common Method in this Respect, for often nothing is a worse Practice.

When a Land of this Kind has been plowed up in the common Way, the Furrows being large, the Turf lies in long Ropes, and will continue growing. To prevent this, these Furrows

must be broke to Pieces. This has been try'd among the earliest Husbandmen by cross Plowing; and of later Times by this unwieldy Instrument, the Drag, but both with very little Success.

In the common Way with the Plow, which is the old Method, they lie too loose to make a due Resistance to the Coulter; and so they rise before it, and are dragged into irregular Heaps, and thus left about the Field instead of being cut to Pieces. In this Case, the Turf, instead of rotting, grows on, and defeats the Purpose of the Tillage.

In the other Way by this Instrument the Drag, it is still worse. The Practice is to lug this across the Field in order to tear the grassy Furrows to Pieces; but this cannot succeed to any Purpose, for these Furrows are very firm and tough, and require a keen Edge to cut them. As the Coulter could not do this in the former Attempt of cross Plowing, it is impossible the Tines of this Drag should do it, because they have no Edge; and, in general, although some Parts are torn to Pieces this Way, yet the most of the turfy Matter is in a worse Manner dragged up in Heaps, and the under Part of the Earth is often left bare for great Spaces together.

This is not answering any Purpose: we have shewn already what Method is to be used on the Occasion; and as this Instrument the Drag does not succeed here, neither will it answer to any other useful Purpose. We have mentioned its Form and Make, that nothing might be deficient; but we advise the prudent Husbandman to have nothing to do with it: let him trust to the common Harrow in light Soils, and have Recourse to the great Harrow in the others, and he will need to trouble himself no farther on that Head.

We have now to mention another Kind of Harrow, since it is customary to call it by that Name, which is used in Grass Lands; and from that we shall pass to the Structure and Use of that natural Contrivance, the Drill Harrow, which will be treated in a distinct Chapter.

The Harrow used on Grass Lands, is not composed of Beams and Tines as the other, but of some slighter Wood-work and Bushes, it is thence called the Bush Harrow, and is used for spreading the Dung or other Manure, carefully and evenly over their Grounds. Its Benefit is very great, tho' of a Kind altogether different from that of the common Harrow, the Sort before described. The Use of that is to break the Clods of Earth, the Business of this is to spread what is laid upon the Ground for enriching it.

We have already in our Second Book, treating of Manures, named those severally which are to be used on Pasture Grounds. Whichever of these are employed, let the Farmer as soon as ever he has got it spread upon the Ground, send in Women or Children, or others who work cheap, to pick up the Sticks, Stones, or whatever other Rubbish may have come among it; and as soon as this is done, let him have Recourse to the Bush Harrow, for the more perfect dividing and distributing the Manure.

Whatever Care may have been taken in spreading it by Hand, many of the Clods will remain unbroken,

unbroken, and it will be thicker in some Places than in others: it is the Interest of the Farmer to have it broke perfectly to Pieces, and to have it spread and distributed equally, and this is the Office of the Bush Harrow.

If the Manure be of the tender Kind, as the Bottoms of old Hay Stacks, very rotten Dung, or the like; he may immediately draw this Harrow over it, and it will break and distribute it very well: but if it be of a harder Kind, as the Mud from Ponds that has any Firmness, or the like; then let him leave it spread on the Ground for some Days, and after the Sun has crack'd the Lumps, take the Advantage of the first Shower, and immediately use his Bush Harrow.

Having thus directed the proper Use of this Instrument, we shall describe its Make, which is the plainest and most natural in the World. Nothing favours so much of the old Original Husbandry, as this Instrument in its first State, nor is it much more elegant in the newest Improvements.

The Original Bush Harrow consisted of a Hawthorn cut fresh from the Hedge, and a little loaded to press it down; this is still used in some Places, and, when rightly manag'd, does as well as any, the Method is this.

Let the Farmer look among his Hedges for a small leav'd Hawthorn: these naturally are more bushy than those with broader Leaves; and let him chuse out the most shrubby that he can find. Let him cut down a large Stem of this, where it may be best spared, and laying it on the Ground beat and press it as flat as he can with a Board, breaking the Branches as little as may be. Such Boughs as will not be pressed down must be cut off, and thrust into the Body of the Bush in the openest Places; and some other Boughs from the Hedge may in the same Manner be thrust in to thicken it, if there be Occasion. These added Bushes are to be well tied in, and when the Surface is flat, full, and very rough, let it be laid on the Ground again, and two or three good Logs of Wood tied on upon the Back to make it firm and heavy.

The Harness of a single Horse is to be fix'd to the End of the Stem where it was cut off, and thus it is to be drawn over the Ground. It will tear and scatter the Manure in a very excellent and perfect Manner.

This is the Original Form of the Bush Harrow, as our oldest Writers describe it, and as it was doubtless practised from the very first Invention of manuring Pasture Ground: its Improvement brings it nearer the common Harrow in Form, but the material Part is the same; for the Work is performed by natural Bushes. The Method of making it is this.

Lay an old Gate upon the Ground, but let it be one that is not rotten, but will hold well together. Let there be a Parcel of Blackthorns cut up, and take the bushiest and roughest of these. Draw them in, and work them between and among the Bars of the Gate, fastening them by Nails, Cords, and otherwise, till the whole Surface be well covered, and very rough: then turn it up, and the bushy Part lying to the Ground, it is fit for Use. The Traces are to be fixed to the Center of the

Gate that it may draw evenly, and it is to be dragged over the Ground as before. This is a more compact Instrument than the other, but it is heavier. The Bars of the Gate serve as the Wood-work of the Harrow in the other Kinds, and the Bushes answer the Purpose of Teeth. The Blackthorn is preferred to the common Whitethorn on this Occasion because it is tougher, and the Thorns are harder. It would be better for the other Purpose as well as this, were it not that it does not grow large enough to be used singly.

Which of these two the Farmer shall prefer, must be determined by the Nature of the Manure he has used. The Convenience of the first Kind is, that it is easily drawn; the Advantage of the other is, that it is heavy and strong. When the Manure is of the tenderer Sorts the first Kind is best; but when it is tougher, and the Clods require more breaking, that made with the Gate is best.

All these Kinds of Harrows are to have a Hook of Iron for the fastening the Traces to them by which they are to be drawn; and this should be well fixed on the Inside that it may not stir.

The Holes where the Tines are let in in the common Kinds, are called the Bulls, and the Tines are in some Places called the Tusks, and the Pins; in others, the Nails of the Harrow.

CHAP. XXXIX.

Of the Drill Harrow.

THIS is a Harrow of a particular Form, and of very late Invention, but it is of excellent Service. The Drill Husbandry is one of the greatest Improvements made within this Century, and this Instrument is a Part of the Preparation for it.

The Method of Drilling is this; when the Ridges are properly raised, and are become moist enough at Top, they are harrow'd once, and that only lengthwise, and then they are drilled. Once Harrowing is generally sufficient, but the Eye of the Farmer is to judge whether it be or not; and, if not, he is to order it to be repeated.

If he find after this once Harrowing, that the Tops of the Ridges are not levelled fit for the Drill to pass thereon, and reach to the due Depth, the Ground must then be harrowed a second or a third Time, till it be in a proper Condition.

The Land being thus perfectly prepared, the Drill is to be brought on. This makes Channels for the Reception of the Seed; and that these may not remain open, the Drill Harrow follows, and drawing the Earth together fills them up.

The harrowing of the Ridges to prepare for the Drill, is to be performed by the common Harrow. The Drill Harrow follows the Drill Plow, and is of no other Use than the covering up the Seed in those Trenches wherein it is laid, by this particular Method of Husbandry.

It was needful to say thus much in this Place

to explain the Nature of the Operation of this Instrument, all which will be understood more fully when we come to treat of that Method at large; but having thus far explained it on the present Occasion, we shall be understood in the Description of the Instrument itself.

This, for so useful a Thing, is exceedingly plain and simple. It is never used alone, but always to follow the Drill Plow; and it consists only of two Beams, by which it is fastened to the Plow; a cross Bar fixed to those two Beams, and a Couple of wooden Teeth let into that Bar: these are all its Tines.

We shall describe here particularly the Dimensions of that used as a Part of the common Wheat Drill Plow. The Harrow which moves on its Beams covers the Seed: and is thus constructed.

The Legs are a Couple of narrow and flat Pieces fasten'd to the Beams of the Plow at their Tops, on the Inside of those Beams: the fastening is by a Couple of stout Iron Pins, which pass through the Tops of the Legs, and the Beams of the Plow, and are fastened on the Outside of those Beams by Nuts and Screws. These Pins are to be made square where they pass through the Beams, that they may be held the faster, and may not be able to turn round in them; but they are to be round near the Heads that the Harrow may move the more freely on them. The other End of these Legs of the Harrow is cut round, and they are let through the cross Bar, which is called the Head of this Harrow, by Holes made for that Purpose, and are pinned in behind it; that either Tine of the Harrow may descend at the Time the other rises, where the Ground is uneven. The two Tines are flat Pieces of Wood, they are let thro' the cross Bar or Head at two and twenty Inches Distance from one another. They are to be pinned in above the Head; and each is to have a Shoulder underneath. These are to be set sloping, so that if they take hold of any Clods, they do not drive them before them, but rise over them.

They must be of such Length as to give Room for the Harrow to sink and rise without moving the Shares up; and to give them the more Room to move, the Legs of the Harrow are to be bent downwards, towards the Middle.

By the Distance of two and twenty Inches allowed to two Tines of this Harrow; each Tine going three Inches and a half on the Outside of each Channel that is next it, fills it up with Earth upon the Seed from the Outside of it. This gives an Inch in the two Rows Distance when they rise; for, as they will come up nearer the Insides because the Earth is thrown in nearer the Outside, they will stand but fourteen Inches asunder, tho' the Channels were made at fifteen Inches. The sloping of the Points also, which is always to be made outwards, brings in so much the more Earth to the Channels.

When this Harrow is found to be too light, a Stone is to be tied to the cross Bar or Head, and fasten'd evenly upon the Middle of it, or a Box made of Boards, and fitted on in that Place is used, which is filled with Earth or other

weighty Materials to keep it steady. A triangular Harrow with many Tines, may also be made for using between the Rows in the Horse-hoeing Husbandry.

In most Lands, and on most Occasions, the Harrow, which is a Part of a Drill Plow, is sufficient for the Purpose of covering the Seeds, but it will not always answer; and the Farmer is not in favour of any new Contrivance, to give up the old when they may be useful.

For Instance, there are many Occasions on which the common Harrow may with great Convenience be called in to assist this Drill Harrow in covering the Seeds.

In tough Soils when the Land is drilled late, and the Earth is moist, it will stick to the Shares in great Quantities; and in this Case not only the Motion of the Plow is hurt, but the Channels will be in Part left open by the Drill Harrow.

For these Reasons it will be best in such Land to take off the Drill Harrow from the Plow, and trust to the covering of the Seeds up in the Channels, entirely to the common Harrow.

When the Drill Harrow is taken off, a Man may follow the Plow in these Soils with a Paddle, or a forked Stick in his Hand, to clean the Sheats from this stiff Dirt. In this Case the Channels, with the Seed in them, will lie in many Parts open, and a common Harrow is to be drawn over the Ground to cover them: for this Purpose if the Farmer shall rather chuse to improve his Drill Harrow than to employ the other, it will be proper for him to order it in this Manner. Let the Tines be of Iron instead of Wood; and let the Legs be placed at the End of the Plank, remote from the Sheats of the Plow. In this Case the Sheats may be cleaned, tho' the Harrow be on, and these Iron Tines will not fail to cover in the Channels.

The Drill in this Case should have only two Shares, and they should stand at about fourteen Inches Distance. In this Case the Harrow answers its Purpose in spite of the Inconveniencies of the Ground; and the Harrow, beside its common Use, serves to turn it.

This is the Way of making the Drill Harrow answer on all Occasions; but it is a very good Method for Wheat in particular, to draw a common Harrow once over the Ground afterwards; for nothing lays it so well.

For this Purpose it will be proper to use two Harrows coupled together, as is a common Custom on many Occasions; and they should in this Case be of the common Make, and of the lightest Kind; and the Pole that fastens them together should be tied in two Places, that they may always go level.

This is a proper Caution for harrowing all Land that is in Ridges; for otherwise the Ridges will be too sharp at the Top, and the Partitions might lie higher than the Rows. Two Harrows thus joined together, go as level and even as one.

The harrowing of Ridges must never be cross-wise, unless they are to be made level for cross Plowing, in order to lay out the Ridges in a Breadth different from that they had before.

When the Ridges are too high, they may be lower'd

lower'd by this Kind of Harrowing; and it is not attended with the common Mischief of treading down the Ground, for the Horse when he draws two light Harrows thus joined together, always treads in the Furrow that is between them.



C H A P. XL.

Of Rolling.

ROLLING is like the preceding Practices, an old Method of Husbandry. Even in Times when the Use of that convenient and familiar Instrument, the Roller, was not known, they used others to break the Clods of Earth in the same Manner as that does it; and these, under the Name of Mallets, or Mauls, are used at this Time in many Parts of the Kingdom: the Roller is, however, so much more convenient, that it ought to be taken every where into their Place.

As Harrowing is on some Occasions performed before, and on some after Sowing, so is Rolling: and it is also sometimes used before, sometimes after Harrowing; and very frequently and properly between the two Harrowings of the same Piece of Ground.

The great Use of all Tillage is to break and divide the Ground; and where there are Lumps of a dry and brittle Earth, the Roller answers very well to that Purpose. It should be on this Occasion used only on such Lands; but the Husbandmen of ENGLAND, for want of making these Distinctions, do themselves great Injury.

In Barley Land the Roller has another Use. It not only breaks the Clods of Earth, but smooths and levels the whole Surface of the Ground that it may be fit for Mowing.

In the old Husbandry when they had sown the Ground, and harrowed in the Seed, they used to go over it with a great wooden Beetle, with a heavy rounded Head: with this they broke the Clods they found left by the Teeth of the Harrow; and when even this Practice had not divided them sufficiently, they afterwards took the Advantage of the first good Shower, and went over the Field again with another Kind of Beetle, and beat and broke them again. This last Weapon, instead of the round Head of the other, had a flat Piece of Board fasten'd in a slanting Direction to the Handle, and of about a Foot square, and two Inches thick. This they usually made of Ash, or some other tough Wood, and by its Blows striking it down and drawing it back, they broke and pulled the Lumps to Pieces, which had escaped the Teeth of the Harrow, and had not been sufficiently divided by the former Beetle.

These were the Operations of the old Husbandry, and these are supplied by the Roller in the same Manner, only with more Convenience and Ease. But here a great Caution is to be given the Husbandman, that he do not, by an improper Use, make that hurtful which might be very beneficial. As the Intent of all Tillage is the properly dividing of the Ground;

when the Roller breaks the Lumps of Earth it answers that Purpose. It does this when it is used on proper Soils, and at proper Seasons; but otherwise it may take an exactly contrary Effect.

Thus, when the Earth is of a tender Kind, and the Season dry, the Lumps are no Way whatever broken better than by the Pressure of the Roller: but if the Farmer will draw this heavy Implement over a Piece of Land that is of a tough Soil, and in a damp Condition, he will press it into Cakes instead of breaking the Lumps; and taking just a contrary Effect to what it ought, this Instrument will in a Manner un-till the Land instead of tilling it.

This is most mischievous of all when it is practised after the Seed is sown; for, in that Case, it squeezes the Soil into Cakes above it, which its tender Shoot will not well be able to pierce; and makes it so tough and stiff about it, that the small Roots will very difficultly make their Passage.

This is the Condition of such Land before it is tilled, and the rolling it after sowing in this Manner, does a great deal toward reducing it to the old Condition again.

All strong Land when it is broken and divided by Tillage, is put out of its natural Condition; and it is from that Time the Tillage is ended, subsiding and saddening into its old Condition again. This is the Husbandman's great Misfortune; but he must be very blameable indeed if he assist it, as he certainly does in a very powerful Manner, when he rolls such a Piece of tough Land in a moist Season after Sowing.

From this reasonable Account of the Nature of Tillage, and of the Effect of Rolling, it will easily be seen that the great Use of that Instrument is on light Soils, and in dry Times; and that its best Service is when it is used in the Intervals between one harrowing and another.

For Barley Land it is very fit to be done after sowing, rolling with Discretion, and avoiding the before-mention'd Errors. Its Use, in this Case, is evident; because the Smoothness and Levelness of the Ground makes it fit for Mowing: but, in the other Case, it is a proper Instrument in the immediate Purpose of Tillage, serving to break the Clods and divide the Soil.

This is the great Use of the Roller, and 'tis therefore the proper Soils are the light Kinds; the proper Seasons are the driest, and the Place it holds in the right Practice of Husbandry, is between the Harrowing and the second Plowing.

Thus when a Piece of Land has been plowed once, let it be harrowed: this breaks many of the Pieces that are too large in the Furrows, and tears up the Clods: then let the Roller be drawn over the Ground, it will break in a proper Manner, and the Clods pulled up by the Teeth of the Harrow, and will prepare the Land excellently for plowing again. This successive Use of the Plow, the Harrow, and the Roller, is the most regular and certain Way of breaking and dividing a hard Soil, and bringing it into a Condition to nourish the Crop.

C H A P. XLI.

Of the several Kinds of Rollers.

ROLLERS are of different Kinds, Forms, and Materials. Some are simple, and others armed with Spikes, or with Edges. In Gardens they use them of Stone or Iron, but in Fields they are of Wood, except the short Roller for Horsehoeing Husbandry; for the Iron or Stone Rollers would there press almost any Kind of Land into Cakes, by their Weight.

The common Roller for the Field is made of the Trunk of a good thick Tree. It should be about eight Foot long, made even all the Way, and fix'd in a plain Frame, in the which it can turn with Ease, and by Means of the fore Part of which it may be drawn by one or more Horses, according to its Weight, the Strength of the Beasts, and the Nature of the Ground. From the fore Part of the Frame there run a Pair of wooden Shafts, and the hinder Horse is put into these for the more steady drawing; and turning at the Land's End, without Trouble.

Next after this, which is the common Roller of our Farmers, we shall describe that which is us'd in the Horsehoeing Husbandry, that being a plain Roller also, though differing in Size and Materials.

This contradicts the general Practice of making the Rollers of Wood for the Field, in that it is made of Stone. It seems of the middle Kind, or to have been contrived between the Garden and the Field Roller, being a small Stone Garden Roller, set in a two Shaft Frame for the Convenience of being drawn by a Horse.

The Construction of this Kind is very easy. The Stone is to be a Yard long, and two Foot six Inches in Diameter. Of this Size it generally weighs about eleven Hundred Weight; so that it is very capable of pressing firmly, and is so short that it is easily and conveniently managed.

Its Shortness also suits it excellently for the Purpose of that Kind of Husbandry, because it can conveniently be drawn in the Spaces left by that Method, where the common great Roller could not come.

The Frame of this is very plain and familiar, it consists only of two Legs or Limbers, through which the Axletree comes at each End, and which are joined together by a Couple of cross Bars near the Stone. This is the whole Contrivance. A Couple of Pegs are driven in each Limber near the Point, which serve to fasten in the Horse, and then this little Instrument is ready for Service.

The two cross Bars are to be of Wood, and they should be tolerably strong, and fastened into the Limbers by Pins. The Ends of the Axletree of the Stone must not stand out beyond the outer Surface of the Limbers, because they would do Mischief by laying hold of the Plants, as this is to be drawn between the Rows; and the hinder Ends of the Limbers should be made to turn a little up for the same Reason.

The Farmer who shall make a Roller on this Plan, must remember the Caution we have given of the Mischief that may be done by Rollers, and never use it but in the dryest Weather; because by its Weight it is capable of doing much more Harm than any other Kind.

It supplies in this, which is its proper Season, the Use of the Plow and Harrow, breaking the Clods almost to Powder; so that the least Rains that follow, dissolve and break them to Pieces.

This Roller, in very dry Weather, is excellent for preparing the Ridges for Turnips. When the Land is in such vast Lumps at Midsummer, that neither the Plow nor Harrow can touch them; this Roller, drawn over the Land, will burst and break them, and it may be easily plowed and harrowed afterwards, so as to be made fit for the Seed.

In the common Methods of Husbandry the spiked Roller, the Structure of which will be plainly enough understood by the Figure, is excellent to subdue the stubborn Land in dry Summers.

When the Ground can no other Way be got into Order for Turnips, this Roller, followed by the great Harrow, described in a preceding Chapter, are excellent.

We have added also in this Place, the Figure of that particular Roller, we have described under the Article of Burnbaiting. This may be called the edged Roller. The only Caution needful to be given the Farmer about this is, that he make the Roller itself heavy enough, and the Blades stout enough, and sharp enough. They will be useful on other Occasions, beside that of Burnbaiting, as has been observed already: and indeed on whatever Occasion there is to cut through long and ropy Furrows, no Instrument is so proper.

C H A P. XLII.

Of the great Advantages of Rolling.

HAVING, in the two preceding Chapters, given the Reader an Account of the Methods of Rolling, acquainted him with the Form and Structure of the several Instruments us'd for that Purpose, and cautioned him against the Mistakes into which he might otherwise have fallen in the Use of them; we shall here deliver more at large the Advantages attending the Use of that Instrument, all of which are perhaps not sufficiently attended to any more than all the Inconveniences.

The great Mischief that may attend the Practice of rolling, is the pressing down and hardening the Ground; but we are to remind the Farmer, that there are Lands of so very light and naturally loose a Kind, that this pressing them down may, at a proper Season, instead of doing Mischief, be an Advantage to them.

We have mentioned the Good Sheep do to certain light Soils, by treading them when put upon them; and these when they are of the most crumbly Kind, are often rendered so loose by the Weather, that they cannot afford a sufficient Hold to the Roots of the Crop. In this

Case

Care the Use of the Roller is excellent, for it presses and fixes the Soil.

This is so necessary in some Places, that the Farmer, though he plow and otherwise work his Soil ever so well, if he omit to roll it will never get half his Crop. Chalks, and the white clayey Soils, are of this Kind; and some others.

Barley is the Crop they roll the most constantly; but taking proper Opportunities, and doing it in a right Manner, it is equally serviceable to Beans, Pease, and other Kinds, not excepting Wheat. It answers many excellent Purposes, and at once strengthens and preserves their Growth.

One material Advantage of Rolling is, that it destroys Insects, and particularly the naked Snail, commonly called the Slug. This Creature breeds in great Quantity among the young Growth, and devours immoderately. Of all Crops Pease are its Favourite, and it eats them from their first Shoot, till the Time of gathering. The great Abundance of this Creature is in the Beginning of Spring, especially if the Season prove warm and showery; and its principal Time of eating is the Morning especially; very early; for as the Day rises it gets into the Ground.

This Knowledge of the Nature of the Creature, will inform the Farmer how he is to destroy it.

The Beginning of Spring is the Season for Rolling, and he must do it very early in the Morning, while the Creature is above the Ground.

Let him observe the Cautions already given, and avoiding those Mistakes with Respect to the Nature and Temper of the Soil, and he will at once, by this Practice of Rolling, destroy the Enemy of his Crop, and make the loose Earth firm for its Support.

It falls out happily for him that the Time of the Slug's greatest Abundance, is the very Season for Rolling his Field in another Respect, because his Crops are at this Time in a Condition to bear it, which they will not when they are more grown.

The Season for rolling Corn is the Beginning of APRIL, and the best Method is to roll that which lies in broad Lands twice in a Place, beginning at Day-break.

In dry and loose Soils the Roots of Corn are apt to be parched and burnt up in long Droughts, and they will suffer greatly by but moderately hot and dry Weather while they are young. The Cause of this is, that this loose Earth not closing about their Roots, gives Passage to the Air and Sun directly to them. Here the Roller comes into great Service, for it presses and flats down the Surface of these light Soils, and puts them into the Condition of such as are heavier.

This rolling the Earth while the Corn is young, has also the Effect of giving them another Dressing, for it breaks and presses the little Lumps of the Soil to Pieces, and this is one great Ar-

ticle of Tillage as has been shewn at large before.

But in all this the Farmer is to take Care that he do not, by rolling improperly, do more Mischief than he can possibly reap Advantage. We have advised him against rolling tough Soils, and against rolling any in wet Weather; and this last is so needful a Caution, even with respect to the lightest Lands of all, that if he should attempt it he would destroy his Crop. The Feet of the Horses would, in this Case, do incredible Mischief, beside the Action of the Roller.

Corn must be at a proper Growth before the Roller is introduced; that is, the Leaves must be strong, but the Stalks must not be at all hardened. And though moist Weather is known to call out the Slug, the Farmer must stay for some that is dry, before he can take this Method of killing it.

When a light Land is roll'd at a proper Season, it becomes so press'd about the Roots of the Corn, that it is able to support the Stalks as they grow up, whereas otherwise they would have rocked about and fallen: but this must be done before the Stalks are grown to any Height, or have acquired any Strength, for when they have got a little Firmness the Roller breaks them, and they never recover it.

For this Reason Wheat in a very loose Soil, may be rolled in OCTOBER and NOVEMBER, and in JANUARY, FEBRUARY, and MARCH; the Winter rolling will prevent the ill Effect of Frosts, as the Spring rolling will that of Droughts.

Great Care is to be employed also in the rolling of Barley. This must not be rolled too young, for then the Pressure of every little Clod will crush and destroy a Leaf, and the Root having little Strength, will not be able to renew it; and if it be roll'd too late the same Mischief will happen as just named of Wheat; that the Stalks will be broken, and the Crop that Way spoiled.

Upon the whole, the prudent Farmer will see that there is not any Part of his Profession which requires so much Judgment as the rolling Corn Lands to Advantage. We would not have shewn the Benefits, without first laying down the Cautions in a very strict Manner; and here we are obliged to give more. The Soil, the Growth, and the Weather, are all to be very carefully observed: when all these favour, the Benefit of rolling will be very great; but when they do not the Mischief may be greater.

This Roller is us'd on Pasture Ground as well as Corn Lands, with considerable Advantage, the Season for that is MARCH, the Earth being then a little moist. It crushes down Worm Casts and small Ant-hills, and rising Mole-hills, establishing the Earth about the Roots of the Grass, and making the Surface level for the Scythe. There will need no farther Caution on this Head, but that the Roller must always be of the heaviest Kind.

BOOK VI. PART IV.

Of the different Manners of Sowing.

C H A P. XLIII.

Of Sowing in general.

WE are here treating of Husbandry, and its several Operations; and in whatsoever Method we should have disposed these, there would have been Room for those who love to cavil, to have disputed the Propriety of the Order. It arises from this, that the Operations of Husbandry are not limited to one Time, or one Use, but the same Procedure answers several Purposes, and is equally proper at different Times.

Rolling is perform'd, on some Occasions, before the Seed is sown, and on others, after that Operation. In the first Case it serves like the other Practices for that Time, to break and divide the Ground; and in the other to destroy Vermin, to fix the Earth to the Roots of the Plants, and to prepare the Surface of the Ground for the Scythe. 'Tis the same with harrowing, which serves in one Case to break and prepare the Land for the Seed, and in the other to cover it. We might therefore have introduced this Article of sowing before, or after, those Operations; but we have chosen to introduce it afterwards, because those several Articles being now dispatched, there will be nothing to break in upon the Course of our Method, when we proceed from the ordinary Manners of sowing, to that excellent and great Improvement made by what is called the Drill Husbandry, which naturally leads to the Article of Horsehoeing, and thence to the cutting and carrying in of the Crop, according to the proposed Method in our Plan.

We have been very particular in cautioning the Farmer, when he is about to raise a Plantation, to chuse properly his Seeds of the Trees; there certainly is as much Cause to be careful in the Choice of those, for his Arable Land: and many of the same Cautions hold good with Respect to both, wherefore we refer the Reader for many Things, to that Part of our Work, that we may avoid Repetitions.

The first Consideration in this Respect is the Kind and Soundness of the Seed, concerning which we shall give proper Directions, as also for the steeping it to promote and encourage its Growth; we are here distinctly to consider the Article of Sowing.

Let the Seed be had from another Land, not the Farmer's own, on which it is to be sown again; and it will be best if, with a proper Degree of Goodness, it have grown upon a worse Land than that whereon he is to sow it.

Even where the Seed is no Way different, and the Nature of the Land the same, it is often found of great Advantage to change it. Thus

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two Farmers at forty or fifty Miles distance, shall mutually find Advantage in sowing each on his Land the Corn that grows upon the other's.

The Seed from a colder Climate succeeds best upon the Land that lies in a somewhat warmer. The ENGLISH Farmer will be sure to find his Advantage, if he will get from the Northern Counties his Seed for the Southern: this is the same Kind of Benefit with that of sowing Seed from a poorer on a richer Ground: the favourable Climate advances it beyond its natural Goodness.

When it is a dry Soil that is to be sown, wet Weather should be chosen, if the Seed be of a Nature to bear wet; on the contrary, in moist Lands a dryer Season is to be prefer'd.

Let the Farmer sow Wheat in wet Weather. It never is too wet for this Purpose, when the Horses and Instruments can go without clogging. On the contrary, let him always sow Rye in the driest Seasons, Rye will come up at its proper Time, without Rain; but Wheat, if sown in a dry Season, will be six Weeks, or more, before it appears, if there fall no Rains afterward.

In general Summer Corn does best when sown in dry Weather. Only black Oats are an Objection to this Rule, for they require a great deal of Moisture, and will not do well without it.

Wheat not only will lie without shooting, when the Season is dry, at and after the Time of sowing it; but in this Case a great deal of it will be lost: for while it lies and does not grow, it will be in danger of decaying. Therefore it is better for the Farmer to wait somewhat beyond the common Season, than to sow his Wheat when it is so likely to fail.

As to the Manner of sowing, it differs on many Occasions, and is accordingly expressed by the Husbandman under a Variety of Names. What they call sowing under Furrow, is sowing the Corn in the Furrow, and plowing a Ridge over it to cover it; sometimes they harrow the Land, and sow Wheat or Rye upon it with a broad Cast, some only with a single, and some with a double Cast, and then plow it upon an Edge in broad Lands, when the Land is dry. Some also plow their Land up an Edge for broad Furrows, and sow their Wheat or Rye on it, and then harrow it over. In strong and tough Lands the superficial Methods are best, and the Method of sowing under Furrow is best in lighter and looser Soils: but all these, and the other Methods of sowing at Random in this Manner, are very imperfect, and therefore less need be said about them. Their Imperfection leads us naturally to that excellent Method the Drill Husbandry, by which every thing wrong in the usual Way of Management is set right; and this we shall, according to its Merit, treat of at large, intro-

introducing it to the Reader by those Reasons on which it is founded, and those Experiments which support them.

C H A P. XLIV.

Of the Depth at which Seeds are to be sown.

WE see that in the Methods already mentioned, the Corn is sown quite at Random. It is scattered in an irregular Manner, and without any Precaution, and cover'd afterwards to an uncertain Depth. It is plain that Irregularity and Uncertainty never can be for the Advantage of any thing, and they should not be admitted in Matters of this Importance.

Certainly Corn will grow from one Depth better than from another, and the more regularly it is sown the better it will rise. The Intent of the Drill Husbandry is to distribute it properly, and to cover it in such Manner as best suits its growing, and this not according to Guess, but upon Experience.

All Kinds of Plants are not to be sown at the same Depth, some requiring more Moisture and more Shelter than others, while they lie in the Ground; and some rot at those Depths at which others will grow best.

To be assured more perfectly of this, the following Experiment may be made. Let a Trench be cut of two Foot long, and at one End let it be two Foot deep, and at the other terminate at the level of the Ground, the Bottom all the Way rising in a slanting Direction. On the Bottom of this Trench, all the Way up, let there be scatter'd Seeds of different Kinds, and then let the Earth that was dug out be thrown lightly in again, covering the Seeds every where, and filling the Trench up to the Level of the Ground.

It will be found, by this Experiment, that none of all the Seeds which the Farmer has to do with, will rise when they are buried at more than nine Inches Depth. At six Inches some Kinds will rise very well, and other Kinds scatter'd with them not at all; and other Seeds do not shoot, unless they be within an Inch or two of the Surface.

This is a plain Experiment, and there can be no Error about it.

Experiments of the same Kind will also shew, that Seeds of the same Species may be buried at a greater Depth in light, than they may in strong Soils. And they will shew farther, that certain Seasons favour the shooting of Seeds more than others.

We find that Warmth and Moisture are the great Articles for promoting the Growth of Seeds. The same Kind of Seed, buried at a Depth somewhat too great, will shoot and succeed if the Season prove favourable on these two Accounts, which if the Weather had been dry, especially if cold, would have lain there without growing.

In some Cases Seeds will corrupt and grow mouldy, when they are covered too deep for their Shooting; but this is not universal. Experience shews that they will lie unhurt in this

Manner, in some Soils, twenty Years: so that on turning up the Earth after that Period, and bringing them nearer the Surface, they grow speedily and well.

It seems, that in some Instances, the Seeds of Plants will lie longer than this, for in many Parts of the Isle of ELY, they never turn up the Earth in a Ditch Bank, but there grows Mustard upon it, although there were none before upon the Ground, or even in the Neighbourhood of the Place. The same Thing I have observed about CHELSEA, with Respect of the Plant call'd Erysinum, or Hedge Mustard. This never fails to shoot where the Soil has been open'd to about two Foot depth. Unquestionably therefore the Seeds of these Plants have long since, by some Accident, been buried in the Earth in these Places, and they keep good there till remov'd nearer the Surface, though they lie too deep for shooting. Air is an immediate Necessary to the Growth of Seeds: it is more required to some than others, and none will grow unless it can operate in a Degree suited to its Purpose.

The Husbandman who understands thus much of the Nature of Seeds, will find that he may preserve any Kind for a long Time good, by burying it in a proper Manner; and he will find, to his more immediate Use, that every Seed has a particular Depth, in a moderate Soil, at which it grows best. He must in his Practice conform to this Knowledge, varying a little according to the Nature of his Soil, sowing a little deeper than the exact Rule in very light Ground, and not quite so deep in such as is very tough and strong. He will see the Reason of this in the Account before given; for the Air certainly has a greater Effect at the same Depths in lighter, than it has in heavier Soils.

When the Farmer has thus much general Knowledge with Respect to Seeds, let him come to the particular Consideration of the several Kinds, and examine what Depth of Covering agrees best with each.

To this Purpose Mr. TULL has proposed the Use of what he calls Gauges, and they will determine the Matter with Respect to every Kind of Seed, with the most perfect Exactness.

C H A P. XLV.

The Practical Method of finding the proper Depth for Seeds.

A SEED is to be sown at that Depth at which it will come up the most favourably: every Seed has its particular Depth for a moderate Soil, which is to be encreased a little in a lighter, and a little diminished in a tougher Ground, and this is the whole Consideration. When a Seed is sown at a less Depth than this it is dried up, when at a greater it is buried, if it be much less or much greater, it will not grow at all: and if but little on either Side, it will grow less perfectly and beneficially to the Farmer, in proportion to the Degree of his Error.

Mr. TULL's Gauges for determining the proper Depth, are made in this Manner. Saw off twelve Sticks, of three Inches Diameter, and bore

bore a Hole in each Stick, and drive into the Hole a taper Peg. Let the first Peg be half an Inch long, the next an Inch, and so on; every Peg being half an Inch longer than the former, so that the last Peg will be six Inches long.

When the Gauges are thus prepared, dig up well a Piece of Ground on the Land where the Crop is to grow. We may make some Gauges longer than those here mentioned, if it were done for Curiosity, and for the Trial of many Kinds of Seeds, as in the Trench before-mentioned; but these are fully sufficient for all useful Purposes to the Farmer, and we now write solely with that View.

When this Piece of Ground is dug and well broken and divided, let the Surface be laid even, and let the Farmer make twenty Holes with his half Inch Gauge in a Row, drawing a Pack-thread Line across the Piece of Ground for that Purpose. Let him have some choice Seeds, and put twenty of them in the twenty Holes. This done let him cover them up, without raising the Earth over them; and stick down the Gauge at the End of the Row. The Seeds will be thus buried half an Inch deep, and no more, and the Gauge being left will be a Rule to know it.

In the same Manner let him use the other eleven Gauges, and after making twenty Holes with each, and putting twenty Seeds in them, let him cover them up, sticking the Gauge at the End of the Row, and wait the Event.

He will see which come up first, which grow best, and which do not shew themselves at all. From observing which Depth answers best to that particular Seed, he will see what is the proper Depth for sowing it in his Field: and this is the Foundation of the Drill Husbandry. So simple and so rational is the Original of that excellent Improvement.

In this Manner let the Farmer try every separate Seed before he sows it, and thus knowing its proper and favourable Depth, let him set the Drill accordingly. Black Oats, when the Drill is set too deep, will scarce come up at all; and most Kinds, if sowed too shallow, are vastly injured; a great Part of the Seeds not sticking root, and those which do, growing in general but poorly.

In general the Danger of sowing in Winter is, the letting in the Seeds too deep, as in the Summer it is the setting them too shallow: and in tough Grounds the great Caution is to be us'd against going too deep; as in the soft and tender Soils, it is most likely to err in setting them too shallow.

The Farmer who tries the Seed with his Gauges upon the Ground where the Crop is to grow, makes himself the most secure that can be: and as he can, by properly setting his Drill, be sure to let all the Seed for his Crop in at the same Depth, he will not fail of Success, according to his Pains and Care.

It is best to repeat this Method for every Field; but he who wishes to spare himself that Trouble, when he thus knows by Experience the proper Depth in one Place, may vary a little in others, according as they are tougher or lighter Soils.

There is a farther Advantage attending this

Practice of setting the Seeds by the Gauges, for it serves to inform the Farmer exactly of the Goodness of his Seed. This is a very important Point, and very difficult to be determined with any Degree of Certainty: Seed Corn may have Faults that escape the Eye, and will not be discovered by any of the common Methods of Trial. If it be good there is no Reason he should sow more than the necessary Quantity, for that is all the Price thrown away, beside overloading the Ground; and if it be indifferent it is fit he sow the more of it, else he will be defrauded of his Crop. He will know what he is to do from the Success of the Seeds set by his Gauge.

He will find the Depths at which they will come up, and mark that at which they succeed best, and this is to be his Rule. Those Seeds which rise from the greatest Depths, are not to be sown at the lowest they will bear, especially Wheat, in a Land that has a damp Bottom; for in this Case the wet will chill the first Roots, which are very tender, and by that Means check the Growth of the Plants: now the Farmer's Business is not only that the Seeds should shoot, but that they should grow well.

Some Differences also, with Respect to the exact Depths, there are to be observed according to the Nature of the Land, as before observed, and according to the Manner in which it is laid, whether that be flat or in Ridges, as also with Respect to the Season of sowing. In all these the Farmer's Reason and Judgment are to be his Guides; no general Rule can suit every particular Circumstance that may happen. The Method of giving Directions usefully, is to lay them down in a middle Way; supposing the Soil, the Season, and all other Accidents, moderate, neither particularly right, nor particularly unfavourable. This is the Course which we have taken. Having added to this the Reasons that shall induce the practical Reader to make the needful Differences, he will see in what Cases he is to vary from the precise Rule, and in what Manner; but as to the Degree of differing, that must be left to his own Prudence, directed by the Nature of the Circumstance in his particular Case. Farther than this no general Rule can go.

We have every where laid down the best Precepts that Experience can furnish to the Farmer, but we no where demand or advise his punctual or exact Adherence to them. The proper End of writing is not to take away the Necessity of thinking in those who read, but to lead them to think, and dispose them into a proper Road of doing it to Advantage. Thus, in the present Work, we deliver first the Reasons of what we are about to advise: and we afterwards give the Directions with as much Care and Punctuality as we are able: but when the Farmer has understood the one, and consider'd the other, let him put them in Practice, according to the Situation, Nature, and Circumstances of his own Affairs, and of the Land he tills.

C H A P. XLVI.

Of the Quantity of Seed to be sown in the Common and Drill Husbandry.

WE have considered the Depth at which Seeds are to be sown, and we have occasionally mentioned the Differences that may be necessary to be regarded in their Quantity, according to their Goodness or Degree of Faults: but there remains a very important Question yet to be determined with Respect to sowing, which is, the Quantity of Seed that in any Kind is needful for a certain Quantity of Ground.

This is of great Concern to the Farmer in the first Place, because the Price of the Seed in some Kinds is a very considerable Article, and in the next, because he may hurt his Harvest, either by sowing on the Ground a smaller Quantity than it would be able to maintain, or a greater. We now come to enquire into the proper Proportion, and shall endeavour to guard equally against Excess and Defect.

It is only according to the new Method of Husbandry that this can be done, because the new Husbandry alone is perform'd by Rule: according to the old Methods every thing was left to Uncertainty.

In the usual Way of sowing by Hand for Instance, according to which ever of the before-mentioned Methods it was done, there must unavoidably be the greatest Uncertainty. For one Man's Hand will be larger than another's, and therefore capable of containing more; and yet the Handful is a Handful among the Farmers in sowing; as the Finger is half a Quarter of a Yard with the Women in measuring, whether it be longer or shorter.

Beside this the Seed or Grain of the same Kind will be sometimes larger, and sometimes smaller, and this will make a very great Difference in the Number of Grains in a handful, and the Number is the only proper Consideration in the Article of sowing.

Another Inconvenience of sowing in the common Way by hand is, that if the Field be but indifferently tilled, as is too apt to be the Case, so that the Earth lie in Clods, and make the Surface consist of Hills and Holes; the Seed Corn, though scattered ever so equally from the Hand of the Sower, will run off the Surface of these Clods and Hills into the Holes; so that it will lie on the Field in general very unequally: and in the same Manner the Crop will rise in Clusters in some Places, and defective in others. This is a miserable Fault, yet it is natural, and according to the common Manner of sowing universal. Thus certain Spots where the Corn rises, are not able to support so many Plants as grow on them, and others are vacant which would very well have fed the Surplus. The Benefits of the Field are thus as unequally distributed among its Growths, as those of Fortune among Mankind, there is enough for all if it were properly distributed, but Millions starve because it is divided unequally.

This is unavoidable in the common Method

Method of sowing, but it is perfectly remedied in the Drill Husbandry. The Corn there is spread in the Seed just as intended, and the Spaces of Ground left vacant are not left so at Random, but just as they may be most useful.

A larger Quantity of Seed than is absolutely needful for the Growth, is also necessary to be employed in the common Way of sowing, because some of it will be buried too deep, and therefore never shoot; and some will be left too near the Surface, and therefore will shoot very unsuccessfully. A great deal of that which lies too naked will be also eaten by Birds, and other Devourers; so that upon all these Considerations, Reason prescribes to him who will sow his Grain by Hand in the usual random Way, that he allow a great deal more than would be absolutely necessary to the Growth.

This is a great Expence if he allows it, and he defrauds himself if he denies it; and at best the whole is an Uncertainty. We shall teach him, by following the Drill Husbandry in a right Way, to save this unnecessary Charge, always to supply his Ground properly, and always to distribute his Seed equally.

His Field shall have just as many Plants on it as it can support, and these shall have the Advantage of every Particle of his Soil. This is all that can be wish'd: this never can be attain'd in the usual Way of our old Farmers; but however great a Thing it may seem to promise, it will be perfectly fulfilled by the Drill Husbandry.

The Seed by this Method is let into Trenches; these Trenches are cut at any Distance that is found best, and the Seed is cover'd in them exactly so deep as it has before been found to require for its most free and perfect Growth.

As this covering up of the Seeds is not done in an uncertain Way as by the Harrow, but with a perfect Regularity, every Seed is sure to be cover'd, so that none is devour'd by Birds. And finally, the Instrument lodges in each Trench exactly the Quantity of Seed that is proper, and no more.

By Means of the Drill the Seeds of all Kinds are lodged in the Earth at proper Depths for their Growth, and out of the Way of Insects in a great Measure, for the greatest Devourers of this Kind prey near the Surface. The few who creep to any Depth, and devour Seeds, are the Sources of the only Accident to which those sown in this Manner can be liable; so that we may, with this small Exception, provided the Seed have been good, answer for the Growth of every Grain.

Here is seen the great Necessity of that Caution we have before directed the Farmer to use in the Choice of his Seed Corn. As the Drill distributes only so much as is necessary, and no more, the utmost Care should be taken that this be all good: for by so much of it as is naught, by just so much will the Quantity be too little for the Ground.

Here the sowing by the Gauge comes into the Farmer's Assistance.

He has bought his Seed Corn, and he has sown twenty Grains of it in twenty Holes, and cover'd them equally. They have all the same Advantages, let him see whether they all come up, or how many are wanting. This will shew him the Value

Value of his Seed: and let him proportion the Quantity he sows accordingly; allowing so much more than what he need to have done if all were good, as will allow for the Defects at that Account.

We do not pretend that this is a punctually exact Rule; for out of every twenty Grains there will not be just the same Number of good and the same of bad; but it comes as near as any Rule in these Cases can do; and what is more to the practical Reader's Purpose, it comes as near as it need.

We have observed, that the Drill Husbandry disposes the Seeds in Rows; and the Instruments are so formed as to suit this Practice to the several Occasions, according to the Nature of the Plant that is to be rais'd. Thus some are disposed in single Rows, some in double, in some three or four Rows are set together. Between these Rows there are Spaces of six, seven, or eight Inches; where there are several of them; and there are larger Intervals between one Set of Rows, and another Set in this Case, and between the single Rows, when they are sown single.

It will be found by all these Trials, that supposing the Seed of equal Goodness, a great deal less is requir'd in the Drill Husbandry than in the common Way. This is not to lead the Reader to suppose, that so many Plants will not be supported upon the same Ground this Way as the other; indeed a great many more will ripen thus than in the common Method: and this, because of the Regularity with which the Plants grow in this Method; for by the other the Wind will dispose it differently, if it be ever so evenly thrown from the Hand; or the Harrow will draw it irregularly in Clusters in some Places from others: beside those other Disadvantages we have named from the Irregularity of the Ground. In these Clusters, though many Plants rise, few come to good, and the vacant Spaces are useless, because they cannot be tilled while the Crop is growing.

In the other Way the Corn grows regularly, therefore one Stalk does not starve another; and the vacant Spaces being left regularly, are capable of being tilled while the Crop is growing, which is a prodigious Advantage.

Thus it is evident a Piece of Land will support more Plants, when they are thus set in a regular Manner, than it can when they are scatter'd in a random Way; and that if it raise fewer, yet these, from the great Perfection in their Growth, produce more in their Kind, because they are better supplied with Nourishment; for in this Husbandry every Particle of the Ground is made to serve the Plants for their Nourishment, as well that which supports their Roots immediately, as that which is left vacant between them.

Let the Farmer understand this Matter perfectly, for on it depends the Principle of this new Species of Husbandry. This is a Fact, that fifty Seeds laid together in a Hole in the Place of one, will not produce so much as that one, when planted as it should be, and properly nourished. The Number starve one another, and not one of them all come to good: on the contrary, a single Grain of good Wheat, properly

sown and encouraged by tilling the Earth about its Roots while it is growing, will yield a Quantity of Seed at Harvest Time, greater than we dare mention to those who have not try'd such Experiments. In the common Way a great deal of the Seed is buried without all Hope of Recovery, and a great deal is lost by various Accidents, as said already, from the other Extrem.

The Husbandmen have never examined, with any Degree of Exactness, what is the proper Quantity of Seed for Land; nor do they make any Difference, at least not any great Difference between the Quantity for an Acre of rich, and that for an Acre of poor Ground; though without Question, that Quantity which would be too little for one, would be found too much by a great deal for the other.

It is to no Purpose to over-load a poor Soil; nor is there any Practice by which the Farmer more defrauds himself, than by not allowing Plants enough to a rich Ground.

C H A P. XLVII.

The Practice in Respect of Quantity in different Places.

IN some of our Western Counties the Farmers sow eight Bushels of Barley on an Acre of Ground. They do not, in this Case, consider the Nature of the Soil, or proportion the Quantity of Seed to it. If it be poor they give it the more Dung; if rich the less will serve; and in either Case the Quantity of Seed is the same.

Their common Practice there is to plow the Land only once, then they double dung it, and after this the Seed is scatter'd in the random Way by Hand, and harrowed into the Ground.

As the Land has now lain some time after the plowing, and is grown hard, the Harrow takes but a poor Effect. In all Probability three fourths of the Seed never gets into the Ground, so as to grow.

This is their Practice, and the Event is answerable to such a Conduct. If the Summer prove dry, the Harvest sometimes will not yield half the Quantity of Corn that was sown: in the most favourable Seasons they seldom get above four Quarters to the Acre. This is a miserable Encrease; but they go on satisfied: labour is cheap, and they live hard: and so they live at all they are contented. What a prodigious Difference is there between this, and the Husbandry of the new Method. In that the Seed all lies at the same Depth, and that is the very Depth Experience has shewn to be the most favourable to its Growth: none is buried, none is exposed; therefore no Allowance in the Quantity, is to be made upon those Considerations. But as the Fly will damage some Seeds, and Frosts may hurt others, a proper Allowance is to be made on those Accounts, and on no other.

Before the Farmer determines his Quantity by the Bushel or the Pound, as is the common Way, let him examine its Size, for a great many more Seeds will go to the same Weight, or the same Measure, when they are smaller, than are requir'd

when they are larger. This will deceive in sowing by the Drill, as well as by the Hand, if Care be not taken accordingly.

To be secure in this Respect, let the Farmer weigh an Ounce of the Seed, and count the Number of Grains in that Quantity; then let him weigh a Bushel, and computing by the Number in the Ounce, he will come near enough to the Number that contains. When the Number of Seeds in a Bushel is thus obtain'd, they may be portioned by the Rule of Three, to the square Feet in an Acre.

A Standard being first established, upon the before-mentioned Principles, this is a certain Method of giving the right Portion of Seed to any Quantity of Ground. But in this the Farmer is also to consider, at what Distance he intends the Rows shall stand; if he designs to plant in single Rows, he is only to consider what he intends to be the Measure of the Intervals; if he design in double, treble, or more numerous Rows, he is to compute what will be the Space of his Partitions, as well as of his Intervals; for the more Rows are planted in an Acre, the more Seed will be required.

When the Farmer has thus far conducted himself according to Reason, not blindly following Custom, let him go a little farther in this rational Way of Computation.

Let him now examine what is the Produce of one middle sized Plant of the annual Kind; and what is the Produce of the best and largest of the perennial; for he may assure himself that a Plant of the perennial Kind will never fail of being brought to this its utmost Degree of Perfection by the Drill Husbandry, connected, as it naturally is, and always should be, in Practice with the Horsehoeing Method.

In all Cases let the Quantity of Seed, according to the preceding Directions for Computation, be proportioned to the reasonable Product. Perennials are best planted, in general, in single Rows; and most of the annual Kinds do best in multiplied Rows, two, three, or more, according to their Nature; but in general the best Procedure for their Growth to their utmost Profit, is in treble Rows, the Rows being seven Inches distant, and the Intervals between them five Foot.

In many Cases it is worth while to go over the Ground soon after the Plants are come up, and thin them to a proper Number, leaving the most thriving. This supposes the using a little more Seed than is absolutely necessary; but it is a very good Method.

In order to the Farmer's being set perfectly right in that great Article the Quantity of Seed, let him set some Rows of the annual Kind thicker than others, and see in the End whether they answer better or worse than the rest.

This is sending him to his own Experience for his Guide, which is the Course we have followed throughout this Work. No Direction is so certain; and the best Office we can do him is to direct his Experience into the proper Course.

C H A P. XLVIII.

Of the Advantages the Drill Husbandry receives from the Hoe Plow.

TO be more particular on this important Head; Reason dictates that the Drill ought to distribute more or less Seed; or in more express Words, a greater or a smaller Number of Seeds in each Trench, in proportion to the Nature of the Plant. This is certainly right: let us see then how we can come at the Knowledge on which this Regulation is to depend.

The Nature of the Plant ought to direct in general at what Distance the Seeds should be lodged in the Trenches; for this will be in a tolerably regular Manner effected by the Quantity allowed to the Instrument: as will be seen when we speak of its Structure. Now to determine this, let us observe what Space a healthy and vigorous Plant of that Kind, which we are about to sow, occupies in its natural Growth: when we know this in a tolerable exact Way, we are so to fit the Drill that it shall leave such a Space between Seed and Seed, supposing all to be good; or a proportioned Space according to the Degree of their Faults.

We shall be surpris'd at first Sight to see a Piece of Land sown by the Drill, and intended to be horsehoed, because of the great Quantity of vacant Space. We take this at first to be unoccupied Land; but in this we err, for on observing the Growth of the Plants in the Rows, we shall see they acquire a Perfection vastly greater than those of the same Kinds in the common Method of raising them; and this is altogether owing to those Spaces. These Intervals we find therefore do, in reality, furnish the Plants in the Rows with Nourishment, tho' at first we thought otherwise.

In this new Husbandry we find, at Harvest Time, that every single Grain of Wheat that has grown well, has produced from twenty to thirty Stalks; whereas, in the common Way of Husbandry, each Grain generally produces only two or three Stalks. Now if these twenty or thirty additional Stalks from each Grain were distributed equally in the Intervals, the whole Ground would appear well covered. They are nourished as well in the Rows, as they would be if thus distributed along the vacant Ground; therefore whatever be the Appearance, the Effect is equal.

We have counted the Stalks; let us next examine the Ears. Every one of these will be found larger and better filled than in the common Way. Therefore as the Number of Stalks made the Growth equal, the Goodness of the Ear will make the Produce richer, and the Harvest more abundant.

This is very plain Reasoning: it is absolute Fact, therefore why should not the Farmer receive it as such, and form his Practice accordingly.

In the common random Way of sowing, the Ground seems well covered with Plants, but as all this Number cannot naturally find sufficient Nourishment in the Ground, and it is

in this Way impossible to supply them better by Means of Tillage, after they are risen; it follows in Fact, as Reason must foresee it would, that a great many of the Plants absolutely die, and many of the others become sickly and weak, none ever wearing that healthy Aspect which is seen in those of the other raising.

In this new Way all the Plants are healthy and strong, and they are supplied, from time to time, with Nourishment, by Tillage of the vacant Land between. Their Roots spread into that Land, and they are nourished by dividing it. The Strength and rich Produce of these, though few in Proportion, might therefore very well make up for the Number of the other small languishing and half-nourished Plants. Facts establish the Truth of this Account; for upon the fairest Tryals, and those frequently repeated, it has been found, that of two Pieces of the same Land, equal in Size, and alike in every natural Respect, the one being cultivated in the old and common Way, and the other sowed by the Drill, and horsed in the Intervals, the Produce of that managed according to the new Method, has been three, four, and sometimes five Times as great as that of the other.

The Benefit of dressing the Land by Tillage, frequently while the Crop is growing, is not confined to the present Growth, it extends to the very Hedges. A Hedge of white Thorn that parts two Fields which are dress'd in this Manner, will grow four times as fast as one of the same Kind in another Place, and in an equal Number of Years will yield four times as much Wood as the other. This Account has been carried much farther, and perhaps with Truth in other Places, I write what I have seen.

This can be owing to nothing but the Advantage there is in stirring the Ground. And it is a Proof that this frequent stirring is of the utmost Benefit to every Growth.

In these Hedges, which are within the Reach of this Tillage, the Branches not only grow sooner to a good Size, but there are more of them. It is exactly the same Case as with the Corn which we have observed rises with vastly more numerous Stalks; and this, beside shewing abundantly the real and great Use of this Practice, points out the Advantage it may have beyond the common Use of it in Respect of Corn.

It is natural to say, that Plowing about the Roots of the Hedges must cut off a great many of them; and in Effect it does so; and it does the same with Regard to the Corn, for however little we may, at first Thought, imagine it, 'tis certain that the Roots of these Rows of Corn do at first spread themselves into a great Part of the five Foot Intervals, and by the Assistance of the Hoe entirely. It is true that the Instrument does cut the Roots of the Corn, and of the Shrubs in the Hedge, and that equally; but from this Cutting there results nothing but Advantage. The Roots of Trees are like the imaginary Hydra, or the real Polype, they grow the more for cutting; and what is very advantageous, these new ones are more proper to draw Nourishment than the old. When a Root, whether of Tree or Plant, is cut off, a Number of new ones are produced from it if it be cover'd by

Earth, and if that Earth be newly dug they spread the more freely and the farther. Thus this cutting of the Roots, in the breaking of the Ground, instead of doing any Harm does the greatest Good, it gives the Plant a thousand new Mouths to feed by, and it spreads Food before them all.

Thus much it has appeared proper to say in this Place, with Respect to the great Produce of Wheat and other Corn in the Drill Husbandry, and the principal Cause to which it is owing. There are those who drill their Seeds without using the Hoe Plow, or leaving Intervals for it, and they succeed better than those who follow the old Way entirely; but the two Methods are naturally connected, and they should not be separated. We see it is to the Effect of the horsing in the Intervals, that the vast Increase from the Drill Husbandry proceeds; and that we have naturally been led to say here, will prepare the Reader for that System which we shall, in the succeeding Chapters, have Occasion to treat of in a more particular Manner.

C H A P. XLIX.

Of changing the Seed.

WE have mentioned, under the Article of sowing, a Thing which it is necessary to speak of more largely here; this is, the changing the Seed, or the sowing upon a Piece of Land the Seed which has grown in another Place, rather than what has been obtained from its own Crop. We there mentioned the Fact that it is found to be a right Practice, we shall here enquire into the Reasons which support that Practice.

Custom speaks very strongly for the Thing itself, and that a Custom not of one Time or Country, but of every Place we know, and of all Times of which we have Account. Flax ripens its Seed very well here, but we import it from FLANDERS for sowing; and in FRANCE, where every thing in many Places particularly favours the Growth of that Herb, we find they still import their Seed from the same Place whence we have it. Our People assert, that when they have ventured to sow the Seed of their own Growth, they have but poor Advantages, compared with those from the Foreign; and the FRENCH, with one Voice, say the same.

In the same Manner many other Seeds are constantly imported from different Countries, though they ripen very favourably with us here in the same Kinds, and the same Advantage is found. Our Farmers from Year to Year, in many Places, change their Seed Corn, and that of other Growths, and they say they find the same Benefit. If there were no apparent Reason for such a Practice, the constant Success so well supported by Evidence, would be sufficient to engage the prudent Farmer to adhere to it. But there are not wanting Reasons which explain it; and we shall propose them to our Farmer, that being instructed in the Nature of this Benefit, he may the more firmly stick to the Practice which procures it.

In the first Place, with respect to the constantly importing the Seed of certain Plants from particular Countries, there may be this plain Reason for the Advantage arising from it, that certain Plants thrive better in some Climates than in others, and in some particular Countries. Where they thrive best they will ripen their Seed more perfectly, for that is the great End of their Growth; and many Plants will do this much better in their native Country, than in any other; though they seem to agree very well with many others.

A Plant that does not thrive perfectly, will not yield perfect Seeds, and Seeds that are not perfect will not give Plants that are. This is a plain Reason why those Plants may be poor which are rais'd from Seeds gathered in a Climate that was not natural to the Kind; and that those may be perfect and fine, though raised in another County, that are obtained from Seeds gathered in its own. Every Plant has its Country, and there is this Reason for finding where that is. We thus not only see the real Benefit that follows this Practice explained, but we are directed to push it much farther, and may thereby improve many other Kinds.

Beside this Difference arising from the Climate in which the Seeds have grown, it is evident that they may be altered by the Nature of the Soil in the same Country, and that they will be much better having been rais'd on one Kind of Land, than on another. In a poor Soil the Plants grow weak and low, they languish as they stand, and it is very natural to conclude, that as the Plants are altogether weak, the Seeds are so too. Imperfect Plants are not likely to produce perfect Seeds. There is great Reason to think the Seeds of such are starved. Plants will not produce such vigorous and good ones, as those would which should be collected from vigorous Plants of the same Kind in the same Country.

We have been very careful in our Directions to the Farmer about Trees, to chuse the Seed cautiously himself, not to get it by Purchase. We have advised him, on every Occasion, to gather it from a lively and well-growing Tree. This is founded on Experience, for every Nurseryman knows, that the Seeds from poor Trees produce poor ones again. As this is a Fact in the larger Productions of this Kind, why should it be doubted in the smaller: certainly it is as true of one as the other.

On this Principle Mr. TULL advises, that the Seed for any Piece of Ground should be got from a Land somewhat richer than itself, and from one that is well cultivated. This seems to contradict the Doctrine of removing Trees from a poorer Soil to a richer in Nurseries, and it might well be retorted upon us here, that this Rule ought to hold parallel in one Instance as well as another. This seems an Argument, and we are aware also that the Opinion of many is against that we have adopted in this Place; but upon the whole Consideration it appears, that what this Author advises is right. 'Tis the first Shoot only that is regarded in Corn, for that is an annual Plant: this is certain to be stronger and bolder, from a stronger Seed: and this is all the Concern.

From these Observations the Farmer will easily gather the Reasons for getting his Seed Corn from a better Soil than his own; but we have observed, under the Article of sowing, that it is adviseable for him to change it merely for the Sake of changing; and in fine these, or any such Considerations, even this Practice, is not without its Foundation in Reason; nor does it want plain Proofs of its Advantage.

Weeds are a great Trouble to the Farmer in his Corn Lands, and there are some which naturally love one Soil, and some another. The Seeds of some of these will be mixed among the Corn, and therefore, as they will be sure to thrive on their favourite Soil, the Farmer when he sows his own Corn upon the Ground again, lays in a Store of them with it. This is prevented by making an Exchange with another Farmer at some Distance, who cultivates a different Kind of Land; and there will therefore arise a great Benefit to both by the Exchange, supposing the Corn of each Ground exactly equal in Goodness.

Let us suppose one of these Farmers cultivates a light sandy Soil, and the other a tough clayey one. The Seed Corn from the sandy Soil is full of the Seeds of the Corn Marygold, and these being sown on the same sandy Ground, would produce that Weed innumerable; but being sown on Clay they will come to little. In the same Manner the Seeds of those Weeds which have a tough Clay, being sown among the Seed Corn on a light sandy Land, will seldom thrive. Thus supposing the Seed Corn to be of equal Value, each of the Farmers gets rid of a great Quantity of Weeds by sowing the Corn rais'd by the other: there is no Disadvantage attending the Crop itself, for Wheat is Wheat, whether it have grown on Clay or in Sand, and it will thrive in either if properly dress'd, so that the Advantage is certain, and there can be no Harm.

Mr. TULL looking upon this Intent of getting rid of Weeds, as the principal Objection to the sowing Seed of the same Ground, infers, that this changing of Seed will not be necessary unless for the Sake of getting of better, or more cultivated Ground, because this Method of Culture destroys Weeds so effectually. It is true that the Horse-hoeing Husbandry does destroy Weeds; but there is no Reason from this to say we need not change the Seed, for this Production of Weeds is not the only Mischief that attends sowing Corn of the same Growth.

We shall agree readily with Mr. TULL, that the Grain of Land cultivated by the Drill Plow and Horsehoe, is fairer and finer than that of other Ground; but we shall not, for that Reason, advise the Farmer to sow it over and over again upon the same Piece of Ground; because Custom, supported by Experience, shews that it is better on many Accounts to change it; neither shall we advise the Farmer always to chuse the finest looking and biggest Grain for Seed. It is a very material Circumstance in the Drill Husbandry, that the Seed be nearly of the same Size; but it is not needful that it be always large; for the Soundness is a more material Article. We find that very small Wheat, provided it be sound and well conditioned, will produce very large and fine Plants;

Plants; and in this there is a plain Advantage to the Farmer, for it goes so much the farther in sowing, as there are more Grains of it in the Measure of a Bushel. It is the Number not the Quantity that he is to regard.

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C H A P. L.

*Of the supposed Change of Species, and of PATNEY Barley.*

WE find that Plants of all Kinds degenerate on Soils that are not agreeable to their Natures: they languish or they are starved in the same Manner, whether it be that the Climate, or that the Soil in the same Climate, make the Difference. The Imagination of one Plant's changing into another, because of the Soil not agreeing with it, is idle and foolish. We no longer believe that Wheat can change into Rye, by the Badness of the Ground, nor any of the like Changes of Species; but what we see and know is, that a Plant which continues the same in Kind, will be worse and worse in Quality, as the Soil and Climate are less and less suited to give it Nourishment. This is what we mean by degenerating, and this is what really happens. A Grain of Wheat, however it be managed, will never produce any thing but a Stalk and Ear of Wheat; but when it is sown on a good Soil, and well cultivated, it will raise a great Number of Stalks, all of which shall have full Ears; whereas, when it is rais'd upon a poor and uncultivated Ground, it shall have but one, and that worth nothing.

In the same Manner that REDI proved the Falsity of the Opinion of equivocal Generation, may any one prove that of the Opinion of Wheat degenerating into Rye, which is equally false, though it was at one Time as universally believed as the other.

In the first Instance People saw Maggots in Meat, as soon as it began to stink, and they supposed they were bred from the Meat. That ingenious Italian placed several Pieces of Meat to stink: some of them he set in open Vessels, and others in such as were covered with Gause, the Flies came to the open Pots, and laid their Eggs upon the Meat, from which Eggs came Maggots, and they turned to Flies like their Parents; but the Flies could not get at the Meat that was covered, so that corrupted as well as the other, but no Maggots bred in it. Hence it was plain, that the Maggots came from the Eggs of the Flies, and were not bred of themselves in the Meat.

In the same Manner the Farmer sows Wheat in his Field, and he sees Rye amongst it, he fancies that some of the Grains of Wheat which he sowed, have produced Rye instead of their own Kind, and this is called degenerating from their Species: but the Truth is, there were Grains of Rye among the Wheat he sowed; and there is no more Reason to wonder. Let him pick a Quantity of Grains of Wheat out of the Ear, and sow them upon as bad Ground as he pleases, the Plants will be poor, but they will be all Wheat. There will be no Rye among them: and let him

examine the Wheat he buys for Seed, in Places where he is used to see Rye grow among it, and he will find Grains of Rye in the Parcel. This is the whole Matter: and thus it is that most of the miraculous Accounts we meet with, come to nothing when we examine them with a due Attention.

The whole Case of the Degeneration of Seeds, when strictly examined, amounts to this. The Seeds of the several useful Plants have been brought to their present Condition by Culture: and the Plants which rise from them will answer, in all Respects, while they are well cultivated also, to those which produced them. This Cultivation consists in giving them good Land, dressing it well, and planting them properly in it. 'Twas this rais'd them to their excellent Condition, and this must, and this alone can continue them in it. They are poorer in their State of Nature, and they will, while they are neglected, be returning to that State again. This is called degenerating; but it is properly a returning to their original Condition: they grow poorer and worse, but they never alter in their Kind.

The great Articles that promote the successful Growth of Plants are two, Heat and Moisture. These differ in various Climates, and in various Soils. The Degree of Heat generally being according to the former, and that of Moisture according to the latter. But we see that a Soil will often act as a Climate, for the Difference of Warmth is great according to its Nature. There may be as much Variation of Heat between a Field of Sand, and another of Clay, in the same County of ENGLAND, as there is between Countries distant by many Degrees.

The Effect of this is plain in what is called the Change of Kind among our Grains.

We talk of PATNEY Barley, otherwise called Rathripe Barley, as if it were of a Kind really different from common Barley. It is the same in Species, but the Difference in its Growth is very great, and by examining this we shall understand a great deal of this whole Matter.

PATNEY is a Town in WILTSHIRE, the Fields about which are of a sandy Soil. Sands, we have shewn, are naturally hot, just as Clays are naturally cold. A Parcel of common Barley being sown in these Fields about PATNEY, will ripen earlier than it would else-where: and the Seed of this Crop will keep this Virtue for three or four Generations.

This Seed, so rais'd from a Parcel of common Barley, is PATNEY Barley, or RATHRIPE Barley. Let it be sown on a light and tolerably warm Soil, and it will ripen a Fortnight or three Weeks sooner than other Barley; and the Grain produced from it will have the same Property for several Successions.

But let this be sown upon a clayey and cold Land, and it will quickly yield common Barley again.

Thus we may, at any Time, make PATNEY Barley out of common Barley; and make common Barley out of PATNEY Barley again.

On this Occasion it may not be improper to add one Caution to the practical Farmer; which is, not to set such a high Value upon this PATNEY Barley as some do. The Change may be



useful on particular Occasions, and for very short Summers, but it is in reality a Change for the worse. PATNEY Barley is shorter liv'd than the common; and it is tenderer, weaker, and worse. The Novelty first recommended it, and Fancy afterwards kept it in Use, because of the short Time it is in the Ground: but those who sow it are, in general, very great Losers by it.

If this RATHRIPE Barley happen to have a small Frost after the sowing, it generally destroys it: this is not a common Accident, because it is sown so late: but it may happen; and when it does, the Mischief is very great: if it have any Check from cold Winds, from an early Drought, or any other Accident, it does not recover as the other, or common Barley will; and at the best, if it be brought to a fair Tryal, and a Field of common Barley, and another of this Kind, be sown on the same Day, and have equal Advantages in every Article, the common Barley will yield a much larger Crop, though it be upon the Ground somewhat longer. This we have thought proper to add for the Information of the Farmer, who may have been misled by Opinion, and a popular Practice. There are very few Circumstances under which it is best to sow the PATNEY Barley; and in all other Cases the Loss upon it is certain, and very great.

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#### C H A P. LI.

##### *Of the Effect of Soils on the Growth of Plants.*

WE see the Soil, in this Case, acts in the same Manner as a different Climate, changing, as it were, for a Time the Nature of the Grain; and the same may be observed of all those other Changes which afford the different Kinds of Seed, Wheat and other Corns, distinguished by our Farmers under a great Variety of Names.

The Exposure may also act with the Soil in this Case. A light sandy Soil under a tolerable Cover, will ripen any Grain sooner by a great deal, than a cold tough clayey Land that lies exposed to the North. The same Mountain in the East produces on the South Side INDIAN Plants, and on the North such as are common to EUROPE. We see therefore, by Instances at Home and Abroad, that other Causes may work in these Things the same Effects as a Difference of Climate. When we thus understand the Nature of these Changes, we shall not be led into the common Errors about them, which often mislead the Farmer greatly to his Hurt. This is all the Truth there is in Respect of these imaginary Changes. The Farmer who reads to learn, and form his Practice according to Reason, will therefore know how far he is to regard them, and how far he is to believe those who speak of them. As to these lesser Changes, he sees to what they are owing; as to those of the varying of one Kind into another, he finds they are false. What we have said of the PATNEY Barley may be applied to every other Instance, and will be found equally true of all. Though in some such a Change is more worth his Regard than in others; because it is more useful.

The Flax of FLANDERS is better than the Flax of ENGLAND, as before observed. The Seed of FLANDERS Flax, gathered there, and sown here, will produce as good Flax as there; but the Seed of that Crop which has grown from the FLANDERS Seed in ENGLAND, produces a coarser Flax, and its Seed a worse still, till we are necessitated to make a Renewal.

It is plain that this is owing to the Difference of Heat and Moisture, not to the absolute Difference of the earthy Matter, which is the immediate Nourishment. That answers for the good Growth as well in ENGLAND as in FLANDERS, as is seen in the first Crop; but it does not here arise to the full Perfection of its forming the Seed, which is the Height of a Plant's perfect Growth; and this is owing to our Country not suiting it in Respect of Heat and Moisture.

This appears to be the Case on the present footing: but perhaps we lay that to the Charge of our Land, which is the Fault of our People. Let them examine strictly upon the Spot, what is the exact Soil on which they raise the finest Flax in FLANDERS, and what is the Management they give it. Let them fix upon the same Soil, and treat it in the same Manner here, and perhaps there will then be no Need to send thither for Seed. At least the Seed of their Flax will hold good through more Generations, as we see is the Case in the Instance just given of the PATNEY Barley; which keeps its Quality many Years, if sown on Land like that of PATNEY, where it was rais'd, but degenerates quickly into the common Kind, when sown on any other.

We shall enter upon this Subject more largely hereafter, under the Article of Flax; but it was here needful to say thus much, producing it as an Instance of these general Truths.

It is plain from this, and from the many other Instances of like Kind mentioned before, that the Nourishment of all Plants is the same, and that the only Difference is, that some Soils abound with that Nourishment more than others; and some Plants, according to their Nature, drain more of it than others. Therefore there is no Plant but will, according to the Vigour of its Roots, rob such other Plants as are near it: and a Soil which is at one Time proper for one Kind of Growth, will be always fit for it, if kept in the same Heart by proper Dressings.

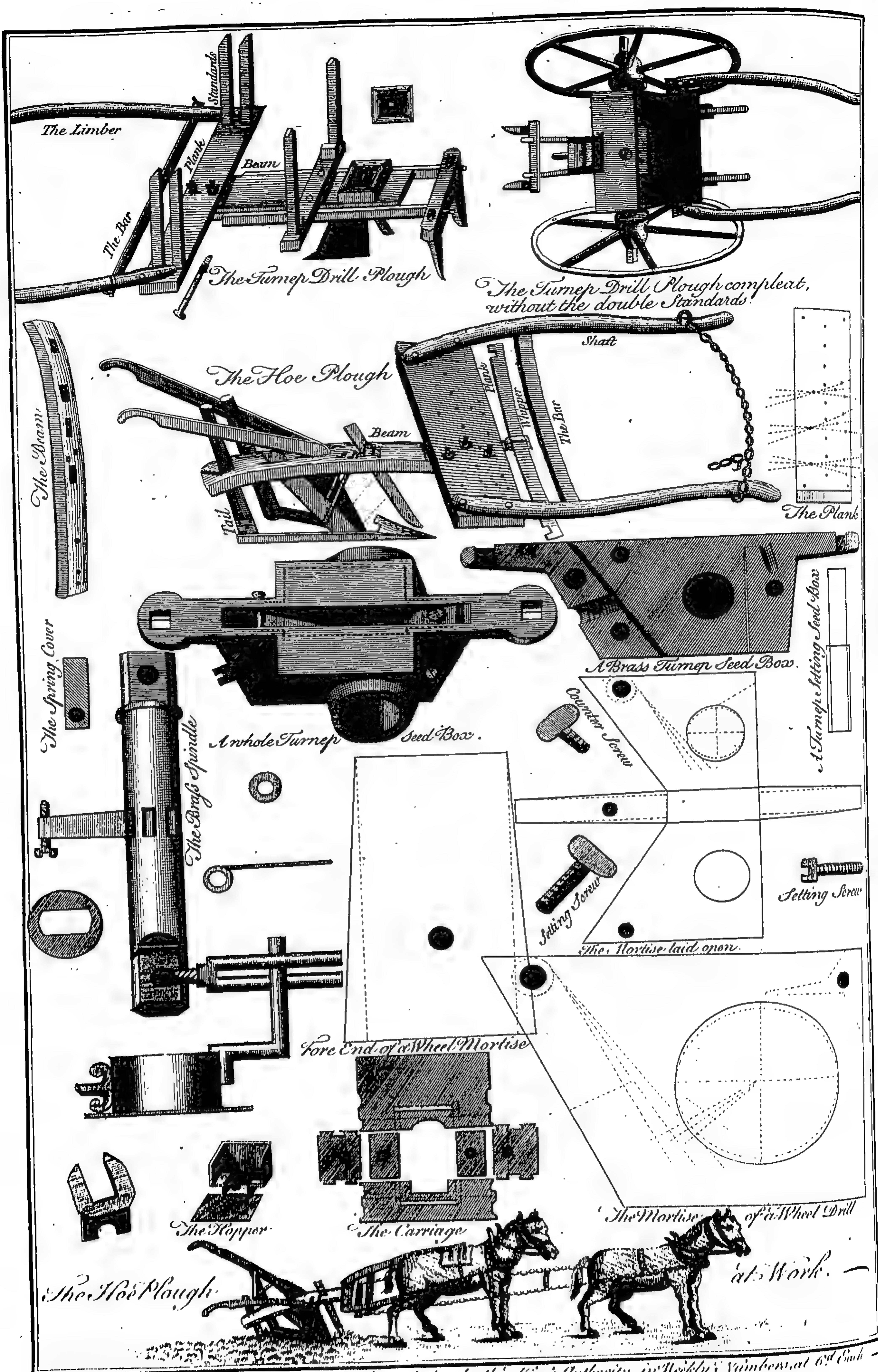
This is, in a great Measure, contrary to common Opinion, but it is not the less true: common Opinion often errs, and in no Respect more than this.

On these Facts, for they will be found such upon the most strict Enquiry, depends that great Improvement of our Husbandry by the Drill and Horsehoeing Method, which we are about to explain, and which will never be thoroughly understood, or rightly practised by any who will not thus deeply enquire into the Reasonings and Experience on which it is founded.

We have abundantly proved that the Matter which nourishes all Plants is the same; therefore, when a Piece of Ground is exhausted, by a Wheat Crop, there is no Occasion to sow it with some other Kind, supposing it has Nourishment for that, although not for Wheat. The better Course is to dress it properly, and get it into

Heart







Heart for Wheat again. This is easily done by the new Method of Husbandry, and that without losing any Time by a general Fallowing, which is a vast Advantage.

We have shewn the Farmer how, by a proper Management, a Piece of Ground planted with Coppice Wood, shall every Year supply him a Felling; and we shall shew, in the same Manner, how a Piece of Ground dedicated to Wheat, or any other Corn, shall furnish him a Crop every Year.

It is very plain that the Advantage found by the Farmers in changing their Crops, is not owing to there being Food of a particular Kind left by one, which is taken by the other; but it is

owing to other Causes: these are the Quantity of the nourishing Matter left in the Ground by the first Crop, the Quantity required by the next Crop, and the Degree of Benefit given by Tillage.

This must be the Case, because we see that all Kinds of Plants growing in the same Soil, take in the same Nourishment. Upon this Principle we act when we propose, instead of changing the Crop, to improve the Nature of the Soil by more Tillage; so that, instead of being in a Condition to support only a poor Crop, it may be able to nourish one of the best Kind; and this is what we now come to treat of under the Article of Drill Husbandry, so much and so deservedly celebrated.

## BOOK VI. PART IV.

### *Of Drill and Horsehoeing Husbandry.*

#### CHAP. LII.

##### *Of the Nature of Drill and Horsehoeing Husbandry.*

**D**RILL Husbandry and Horsehoeing Husbandry come very properly to be treated together, because they will never succeed so well as when they are used together. Some Farmers have practised the Drill Husbandry alone, and they have found Advantage from it, as doubtless they must, because of its superior Benefit to the common Kind; but they might have found much greater Profit in using both together. We have, in the preceeding Chapters, informed the Farmer so fully concerning the Nature and Growth of Vegetables, that he will understand the Manner in which this Husbandry produces such Excellence in all Kinds of Plants, and we may now therefore proceed to the shewing distinctly and exactly what it is.

Drill Husbandry is the Practice of the Garden brought into the Field; and Horsehoeing, in the same Manner, is that of the Nursery employ'd in the Service of Corn. We all know the Practice of the Garden to be better than that of the Field, only more expensive: there is therefore great Merit in bringing it, so far as that can be done, into the Field: and the same is exactly the Case with the Operations of the Nursery.

In the Field, Corn is scattered at Random, and cover'd at different Depths; in the Garden Seeds are set in Trenches, drawn with Regularity, and allowed to the same Depth, and that adapted to their Natures. Now in the Drill Husbandry the same is done in the Field. A Plow is used to this Purpose, that makes Trenches of a proper Depth, according to the Nature of the Seed: the Seeds are spread in due Quantity in these Trenches, and covered equally in them, so that the Practice of the Garden is here exactly brought into the Corn Field, only in a more exact Manner: and what is very remarkable, and very advantageous is, that the plowing, sowing, and harrowing, is all done at once.

When Corn is sown in the common Way, there is no meddling with the Ground afterwards, because of its irregular Growth; so that the Earth cannot be divided and broken, to give it more Nourishment; nor can Weeds be conveniently destroyed. But in the Drill Husbandry there may be left Intervals between the Rows, whether they be single or double, and these Intervals, admitting the proper Instruments, may be tilled so that new Nourishment may be given to the Roots, and the Weeds may be perfectly destroyed: this is exactly the Practice of the Nursery. Where the young Trees are planted out into Rows, with Intervals of three Foot or more between them; and those Intervals are, from time to time, dug up. This destroys all Weeds that would exhaust the Ground, and at the same Time breaking and dividing it, serves to create, as it were, new Nourishment.

We have explained already in what Manner the Earth is, by this digging and breaking, prepared to give Passage to the Roots; and we have shewn how those Roots are multiplied by the cutting them off in the digging. This we have shewn in Theory; and the Advantage so well known to attend this digging between the Rows in Practice, shews that what was there advanced is true.

The same Effect which digging takes upon the young Trees in a Nursery, it will take upon the Crop in a Field, whether that be of Corn, or of whatsoever other Kind; for the Reason of the Thing is the same in both Cases, and what is thus founded on Fact will never fail. We see therefore here the Practice so advantageous in the Nursery, like that of the Garden, brought into the Corn Field; and so well have the Instruments been contrived by which it is performed, that the Service of Horses in drawing them, does as well as the Labour of Men's Hands.

When the two Methods of Drill and Horsehoeing Husbandry are used together, the Crop is planted regularly, and the Ground is tilled while it



it is growing. The Seeds are covered to a proper Depth, they are proportioned to the Quantity of Ground, and as they come up the Plants are fed in the most happy Manner by a continual new Supply from frequent dividing and breaking of the Ground. No more are rais'd upon it than it is able to support, and these have the full Advantage of all its Fertility.

This is the Husbandry according to the new Method: in this all is Regularity, and in the other all is Confusion and Disorder.



### CHAP. LIII.

#### *Of Drilling.*

**D**RILLING, according to the Account we have given already, is disposing of Seeds regularly in Rows, and covering them with a Quantity of Earth, proportioned to the Depths at which they are found to be most advantageously planted. We have shewn already how that exact Depth is to be found by Experiments made with Gauges; and we shall, in a succeeding Chapter, describe the Instrument by which it is perform'd, with the Assistance of a Figure. We here treat in general of the Method.

The Drill Plow makes Channels at regular Distances, and of proper Depths; it spreads the Seeds in those Channels, and it covers them up with Earth. All this is done with great Exactness and with great Expedition.

The Seed Box, which is the great Article in this Invention, is a Part of the Instrument: it performs the Office of a Hand in sowing the Corn, but it does it in a much better Manner; for it numbers out the Seeds as it receives them, and distributes them in the Trench with the most perfect Exactness.

The Disposition of Plants in Rows, which is never to be done in Fields any other Way than by drilling, has, beside the great Advantages already named, this not trivial Benefit, that the Crop comes up together, and 'tis scarce possible any Weeds can rise among it. The Corn, or other Growth whatsoever that is sown, rises in Lines, and the Weeds naturally are seen in the Intervals between them: and however near they seldom are exactly in the Line. This answers a Purpose not to be despised, for it betrays Weeds at once by their Place, so that they may be taken up while young; whereas, in the common Way, they exhaust a great deal of the Good of the Soil, before their Shape discovers them, even if they are taken up afterwards.

Charlock looks very like the Turnip in its first rising; and there are several Kinds of Grass which look like the first Shoots of Corn. When these grow among those Crops, they must stand till they are grown up to be discovered; whereas, when the Seed has been sown by the Drill, we know that if any thing rises out of the Line it is not a Part of the Crop, however much it may resemble it.

We see therefore that the Drill Husbandry at once places the Seeds in such a Manner in the Ground, that they may have the greatest possible Advantage from it; and betrays, at their very

first shooting, those Weeds which would have rob'd it of Part of that Nourishment.

It makes Way for the stirring and tilling the Ground, during the Time of the Crops growing upon it, which is a vast Advantage, and cannot be obtained by any other Method.

By this Means also there is an Opportunity of destroying the Weeds at any Growth, in the most perfect Manner, which could not be done if the Corn, or other Crop, were disposed in any other Manner than in Rows, leaving these free Intervals: and thus those useless Plants which would have exhausted the Nourishment due to the Crop, are torn up and buried in the Earth, and becoming there, as they rot, a Kind of Manure, they supply it with new Matter of Nourishment instead of exhausting them.

These are the peculiar Characters and Effects of the Drill Husbandry, which although in itself useful, yet has no Benefit so great as that it makes Way for the other Improvement by Horsehoeing. They are therefore extremely to blame who use one without the other.



### CHAP. LIV.

#### *Of Horsehoeing.*

**T**HE Advantage which the Earth receives from Tillage are of two Kinds, the destroying of Weeds, and the breaking and dividing the Particles of the Soil, in such a Manner that they may afford more Nourishment to the useful Growths. These Advantages cannot be obtained by any other Method so perfectly, as by Horsehoeing; and therefore, in the Nature of the Thing, Horsehoeing Husbandry is preferable to any other Kind.

The Plow prepares the Ground for a Crop; but it goes no farther, for it cannot be used in the common Way of Husbandry, after the Crop is up: but the Crop may receive greater Benefit from the Tillage of the Land while it is growing, than it could in the Preparation.

When the Earth is well prepared for a Crop, it is broken and rendered loose, but from this Time it naturally clods together, and grows more compact. Plants require more Nourishment when they are grown to some Height, than when they are very young; but in this common Practice they have less: because the Soil grows worse and worse from the Time of sowing. The Horsehoe breaks and tills the Land while the Crop is growing; and by that Means gives the Plants a new Supply, when they most want it.

Plowing and hoeing differ in this more than in the Form or Shape of the Instruments with which they are done: a Hoe may answer the Use of a Plow in breaking the Ground before sowing; and a Plow may be used, as it really is in this Method, to tear up the Weeds while the Crop is upon the Ground. It is in this Period of performing it, that the Work actually differs. As plowing is the preparing Land for the sowing of a Crop, hoeing is the tilling it when that Crop is growing to Maturity.

If Land be tilled ever so well before hand, that will not prevent the Growth of Weeds, for although



although the Roots of all that grew there before were destroyed, the Seeds of others are continually brought by the Wind, and the better the Condition of the Land is, the surer they will be to grow.

To the Farmer's Misfortune those Weeds which are most troublesome and mischievous, have Seeds winged with Down, so that they fly to great Distances. Of these Kinds are Thistles, Sow Thistles, Coltsfoot, and many others the most troublesome that can infest a Crop.

No Care in tilling the Land before hand can defend it against these; on the contrary, the fitter it is for the Crop, the fitter it is also for them: the more firmly they will take Possession, and the more quickly they will multiply, therefore something is needed afterwards. The Labour of Weeders is very expensive, and in the common Way of sowing they cannot avoid greatly damaging the Crop. When the Seed is drill'd it is easy to get between the Rows, even with a large Instrument, and the Advantage is evident; and the Work cheaper.

We see the Benefit that Herbs receive from a careful transplanting, this arises from the cutting off the Ends of their Roots, and the placing them among new dug, that is, new tilled Earth. This would be impossible in many Cases; for who could think of transplanting a Crop of Corn; but the same Advantage is given it when it is planted in regular Rows by the Drill, and the Earth is plowed up between by the Hoe Plow; for in this Case the extream Roots are cut off, so that the Plant is urged to send out more, and there is new tilled Earth for their Reception.

The Advantages arising from the hoeing a Garden Crop, in the common Way, with a Hand Hoe, are very great; and these are all communicated to a Field of any useful Growth, by the Hoe Plow properly used, only in a more perfect Manner.

Some People who follow the new Method rob themselves of half its Benefit, by their Fear of setting about it with Spirit. They drill their Seed in Rows a Foot and half distant, and then cut up the Earth lightly by a Horse Hoe between. This is of the Nature of the Garden hoeing, and is of great Advantage, but let it be done properly, and it will be of much greater.

If Wheat be drilled in treble Rows, with Partitions between each Row of seven Inches, and there be an Interval of five Foot between every three Rows, and the next three; in this Case the Corn itself will prevent the Growth of Weeds in the Partitions, and the Ground in the Intervals may be tilled deep and well with the Hoe Plow, and the Crop will be twice as good as in the other Way.



#### CHAPTER. LV.

##### *Of the Benefits of deep hoeing.*

**T**HE shallow turning up the Earth between the near Rows, serves as hoeing in Gardens, assisting the present Crop, but it has no Numb. XXVIII.

farther Effect; on the other hand, the deep hoeing in the five Foot Intervals, serves in the Place of fallowing, and will, if the Farmer please to do it well, and depend upon it entirely, answer the Purpose of Manure; though on many Occasions it will be worth his while to assist his Crops by both Means.

The hoeing in this deep and perfect Manner keeps the Earth always moist, it disposes it to receive and detain the Dews and small Rains. The more Land is tilled the more freely it receives the Benefit of these, and the more serviceable it makes them to the Crop. A Piece of hard Land is either dry as a Stone, or poach'd with Wet, for it detains what falls upon it too long; and often this is so chill'd that it hurts the Growth. The fine and well tilled Earth, as it receives the Rains and Dews, distributes the Wet equally, and as it does double Service, it never can do any Harm.

Experience confirms all that is here said of the Benefit of deep hoeing. If a Piece of poor Ground be sown with Wheat, when the Plants are yellow and sickly, let a Part of the Field near them be well hoed in this Manner, and they will be found to revive immediately, as if watered by the most kindly Shower, and they will continue to grow and thrive in Proportion as the Practice is continued.

It may be proper to acquaint the Reader here, that if he expect the full Advantage of hoeing, without any Injury or Accident, he must prepare the Ground for it by a thorough and good Tillage beforehand: for when the Earth is hard, as it will be when but half tilled, the Hoe Plow often breaks it up, or cracks it among the Rows, if it be carried deep enough; but when the Earth has been put into a good Tilth before, there never comes any Harm of the deepest hoeing, for it all crumbles at the Surface about where it is turned.

For the same Reason that the stirring and breaking of the Earth is useful in affording Nourishment to the Plants that grow near it, the deeper that is perform'd, provided we do not go through the good Soil, the more will be the Advantage: for Plants spread their Roots in Breadth and send them down in Depth, to a certain Degree at the same Time; so that the Intervals between two Rows of Corn, by being stir'd and broke to eight Inches deep, afford a certain Proportion of Nourishment, which the Corn would not otherwise have had. If the Earth be stir'd and reduced to a proper Degree of Fineness, to sixteen Inches deep, provided it be good and fit for the Nourishment of Plants so far down, the Consequence will be, that the Plants in the Rows will receive Nourishment from it in a double Proportion. This is the Difference between that slight hoeing that is perform'd between the Rows of a Foot and half Distance, and the deep hoeing between those where the Interval is five or more Feet.

This shews also the Propriety of leaving those wide Intervals: and all that will reason upon the Matter must find, that it will be to their Advantage to have such; but nothing is so difficult to conquer as Prejudice: and that is against the Practice in this its full Latitude.



A Farmer, when he is directed to plant his Wheat in treble Rows, likes that well enough; but when we name a five Foot Interval between these Sets of Rows, he starts at the Thought of losing so much Ground; for so Prejudice and the common Opinion, represent it to him. But we shall shew him that there is no Way in which the Ground does so much Service, or turns to so great Account. In order to be perfectly understood, let us first enter upon the Consideration of the Rows.

The Drill Plow may be so made as to sow a great many Rows at a Time, and those at small Distances: but this is not the most profitable Use of it. Some who are, at this Time, introducing the Use of Drill Husbandry without Horsehoeing, are practising this, and call it an Improvement; but they should be better inform'd. It was practised long before by Mr. TULL, and he gave it up because he found it less profitable than the other. Drill Husbandry and Horsehoeing Husbandry are two Things, but they should never be separated; and to practise them to the best Advantage, the Rows that are sown by the Drill should never be too near.

Some Plants, as we shall shew hereafter, thrive best in single Rows, with large Intervals between, and others do very well with three or four Rows near together, and then a large Interval. In this last Case the Rows should be about seven Inches distant from one another, and the Intervals between one Set of them and another, considerably broad.

When these three or four Rows rise up to a small Height, they blend in such a Manner at Top, that they make one broad Row together. We call them altogether, in this Case, a Row, and when we speak of the Intervals, we mean those between one Set of these Rows and another.

These Intervals are to be broader or narrower, according to the Nature of the Plants in the Rows, the largest Plants requiring them broadest, and receiving most Benefit from them.

Every Row of Plants to be horsehoed, must have an empty Space at least on one Side, of two Foot and a half broad for the smallest Kinds, and for all Sorts of Corn it ought to be about five Foot. Smaller Intervals do in Gardening, because the Hand Hoe only is used, and does not go deep; but when the Hoe Plow comes, and cuts up to such a Depth, a larger Space is required, because the Roots of the Crop will penetrate farther.

The Farmer will be the more easily reconciled to this Practice, when he shall be told that although there be five Foot Spaces between the Rows of Wheat in an Acre of Ground, yet the Stalks in those Rows will be more in Number, than there are usually upon an Acre in the common Way. This may be found by Computation, and this shews plainly, that it is an Error to imagine there is any Loss of Ground by Means of these Intervals.

If the Ears were equal in Weight and Goodness, the Crop would be equal, because there are the same Number one Way and another; but the Ears are finer and better filled in the horsehoeing Way, and therefore the Produce is greater.

These are Facts, and this is a Manner of arguing that cannot mislead.

When these Intervals are horsehoed, the Roots of the Crop penetrate quite through them. Therefore the Crop upon a Piece of Ground thus managed, while it seems less is really greater than in the other Way; and though a great Part of the Land seems unoccupied by it, yet every Particle of it is occupied, for as the Roots from the Rows penetrate through the Intervals, they also entirely spread over or fill those Intervals.

Many Experiments have been made to determine this Matter of the Loss or Gain by these large Intervals, and the Result of all is, that the larger the Intervals are left, to a very considerable Breadth, the greater always is the Crop.

In the same Field wide Intervals and narrow Intervals have been try'd, both without the Assistance of Dung; and in the other Parts of the Field Dung has been used in the common Way without hoeing. The Result of such Experiments must be conclusive; and it has appeared from these, that the dung'd Part without hoeing, did not yield a Crop nearly equal to the hoed Part; and that the hoed Part, where the Intervals were widest, yielded the largest Crop of all. Therefore hoeing is preferable to Dung on two Accounts, for it costs less, and it produces more; and the wider the Spaces the more Benefit there is from the hoeing. But these are only the general Facts, the Farmer is not to determine his Practice by them in every particular Instance. We shall, on some Occasions, advise him to have the Intervals moderate, and on others to use Manure with the hoeing.



## CHAP. LVI.

### *Of the different Appearance of Crops.*

THE Corn sown in the common Way often will make a better Appearance at first, than that which is drilled and horsehoed; but it declines toward Summer, as the other advances: and though the Seed Corn have been the same, and the Land the same in every Respect, the Crop from the horsehoed is, as observed before, vastly the larger.

When the Intervals are sufficiently large, they may be horsehoed several times while the Crop is growing in the Rows: in this Case the Plow may come pretty near the Edges of the Rows the first Time, but not so near the second, and so on, till for the last Time it must be carry'd only along the Middle. The Reason of this is, that it would else crack the Ground too much in the Rows, and break off too many of the largest Roots, if the Instrument run very near, when the Crop was well advanced in Height.

It is always to the Advantage of Plants, that the small Roots should be broke off, but when they are grown to a considerable Size they will receive too great a Check by breaking off the larger; therefore only the Middle of the Interval is to be broken up at that Time; and even there, there will be small Roots, which being broken off by the Plow, will send out innumerable others into the Earth thus prepared to receive them,



them, and give them Nourishment. These new Roots are full of Mouths for receiving Nourishment, as has been shewn already, and they find it in Abundance; so that Reason shews how it is that this hoeing only in the Middle of the Interval so vastly invigorates the Plant.

It is very plain, from repeated Trials, that this Practice of hoeing will give more Nourishment to a Crop that has no other Assistance; than the common Method by Dung; but there is a farther Consideration arising from the Continuance of the Effect, which is of very great Weight, this is, that so far is the Land in general from being exhausted by this Method, that the more successive Crops are planted in a Piece of Ground, with wide Intervals, and well hoed, the more able the Land is to maintain them. The last Crop is better than any of the former, and this without renewing the Richness of the Ground by Dung, or exposing any Part of it to the Loss of Time by a Fallow. This hoeing serving in the Place of fallowing; and the Intervals, while they are supplying the present Rows, being preparing for the Support of others.

The Kind need not be chang'd as it must be in all other Husbandry, because of the Ground's growing poorer, for in this Case it does not grow poorer, but becomes richer every Year.

When a Piece of Ground is prepared by Dung, it bears Wheat the first Year, but the next Crop must be of an inferior Kind, because the Soil thus prepared, is growing worse continually. But on the other hand, the Ground is growing better continually, by this Method of Horsehoeing, and consequently Wheat may grow on it every Year.

If there were to be any Change of Kind in Fields thus tilled, it would be that the first Crop should be the poorest, and that the Farmer should rise to a better and better every Year, till at last he come to Wheat: but it may, in general, be prepared for Wheat at first, and will continue fit for it throughout.

The wider the Intervals are, the more the Earth may be divided, but as there must be a certain Compass to allow a Possibility of the doing it well, we shall shew what is the smallest Space that will allow it. There is not Room to turn two deep clean Furrows in an Interval that is narrower than four Foot eight Inches. If any one should attempt it in a smaller Interval, he would throw one of the Furrows, if not both, upon the next Row, and this would do great Damage. Such Plants as grown Saintfoin and the like, that can bear to have the Earth drawn off of them by Harrows may indeed bear this, but even they will be the worse for it.

The Farmer is, in all Respects, to suit his Practice to his particular Situation: let him not therefore be tempted by all that is here said, though it be all perfectly true, to follow this Method of horsehoeing against all other Measures, in every Situation. If he have a dry and brittle Land, on a level Situation, he is best of all suited for it, for it is with this Land it best agrees. If he have tough heavy Clays let him first improve them well with Sand, as directed in its Place, and then use the Horsehoeing Husbandry; and if he have Lands upon the steep Descent of Hills, let him then follow the old Me-

thod, at least in such Places; for they are not suited to a Practice which requires so frequent and such deep Tillage. In common Fields as the Custom and Practice stand at present, he cannot well follow this Method: but from what we have said on that Head already, and from what Truth and Reason so plainly point out, we hope we shall see this Objection to the Horsehoeing Husbandry daily diminish; and Inclosures take the Place of common Fields, in every Part where private Persons can discern their own Interest or publick Good promote it.

This Method of Husbandry has been adopted very much in FRANCE, and has been found, by frequent Trials and the strictest Computations, to be greatly preferable to the common Practice, and as we see the Farmer's Profits so low that the Rents in most Places are ill paid, and the Farms continually thrown up; is it not greatly to be wish'd that a Practice invented in our own Country, should also be followed in it, while we see others enriched by using it, and ourselves impoverished for want of some Improvement in the common Methods? The Legislature has interfered lately to introduce the Use of Broad Wheels, partly by Penalties on the other Side, and partly by Rewards and Encouragements to those who shall use them. How much is it to be wish'd, that the same Interposition could be obtained in Respect to this Practice, the Consequence of which must be as much more beneficial, as the Importance of being enriched is greater than that of Travelling at Ease.

As to the Objection of using this Improvement in common Fields, the same holds good against any other. We have found, of late Years, the Advantage of raising what are called the Artificial Grasses, Saintfoin, Lucerne, and the like. But this can no more be practised in common Fields than the Horsehoeing Husbandry, because People must observe the same Turns of plowing and fallowing with the other Occupiers. All that can be infer'd from this is, that the Interposition of the Legislature is indeed wanted for the Encouragement of Husbandry.

Having thus laid down the Advantages of the Drill and of the Horsehoeing Husbandry, and shewn why they should always be used together, we shall proceed first to explain to the Farmer, the Instruments that are employ'd in this Practice, and then to the Manner of using them for the several Kinds of Crops. We shall first convey to the Reader a general Idea of the Drill Box; and afterwards appropriating it to Wheat, the most considerable Species, we shall shew it by Description and Figures, as fitted up for Use in the Drill Plow; and having thus explained the Manner of sowing the Corn, we shall describe the Hoc Plow, by which the great Advantage of Horsehoeing is to be given to the Crops properly disposed by these Instruments.



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## CHAP. LVII.

### *Of Drill Boxes.*

**I**N the Drill Husbandry an Instrument is us'd for sowing which performs at once the several Operations of opening the Trenches, disposing the Seeds in them, and covering it up when there. The first Part is performed by a Plow, the second by the Drill Box and the third by the Harrow.

The Plow has its Shares so disposed as to cut the Trenches of a proper Depth, at regular Distances, and in a certain Number; the Drill Box disposes the Seeds; and the Harrow covers them. These three Parts compose one Instrument. The Harrow we have occasionally named already, among the other Implements of that Title, and we shall treat of it more largely, as also of the Plow: the present Business is to consider the Structure of the middle Part, the Drill Box, which is the material Article.

The whole Instrument consists of the Plow and Harrow, the Seed Box and Hopper: of these the Seed Box is the great Consideration, this receives the Seed from the Hopper, and delivers it out regularly into the Trenches.

The Mortise is a very material Part of this Implement, and it differs from a common Mortise, in that it is impossible, from its Shape, to fit it with a Tenon, being narrower above, and shorter below; all this will be represented in the Figures.

A Multitude of Words might be used to describe this, and the other Parts of a Drill Box, but the Assistance of the Plates will spare them. It is sufficient if we can convey such an Idea of them that the Farmer will be able to understand them, when we have Occasion to mention them, and the Workman to make them, and to compose the whole: more than this we shall not endeavour.

This Mortise being understood, we shall consider its Use in the Drill Box, and thence the other Parts of that Machine. Let us suppose it a Seed Box for Turnips, it will appear as represented in the Figure under that Name. The Reader will there see the upper and lower Edges, and the Manner in which they are placed over one another. We shew the Top of the Mortise, and the Bottom with the lower Edges.

We have represented, in another Figure, this essential Part, the Mortise cut through and laid open. It is shewn as cut down by its four Corners. If the opposite Sides and Ends were all rais'd up, the Mortise would be formed. A great deal of Care must be taken in making this true, for upon that the Success of the whole Instrument depends.

We have added after this the Mortise of a Wheat Drill, in order to shew that very essential Part the Box, or great Hole, which being larger is best shewn in the Side of that Kind. This Perforation is the Section of a Cylinder that passes through the Mortise.

We have represented in another Figure, the Tongue of the Seed Box, which, in some Degree, resembles the Tongue of the Sound Board of an Organ; but it differs, as is evident, in Shape, in Situation, and in the Manner of its being fixed to the Mortise. The Breadth of this Tongue must be conformed to the Breadth of the Mortise and its Bevel. The Length of it must be such that it will reach lower than just to touch the Bottom of the great Hole.

If the Tongue have too much Play, the Seed is apt to be turned out irregularly.

We have next given the Figure of the Steel Spring in a Turnip Seed Box, which serves both for a Tongue and a Spring.

The Setting Screw is another very material Part of this Instrument, we have therefore represented this plainly and separately. It must be of Iron, and it is to pass through the Hole in the fore End of the Mortise.

We have next represented a Notch of the Spindle, with its Ends near it. And we have next given the fore End of a Wheat Mortise, with its Hole through which the Setting Screw is screwed: and after this the hinder End.

These are the principal Parts of this useful Implement, which the Workman will easily understand; and which we have named and figured, because we shall naturally speak of them in the Course of the Work. And having thus first represented them separate, we have given after them the Wheat Seed Box entire, with all its Parts and Appurtenances: it is there represented as standing on its Bottom; and the Reader will easily distinguish its Cover, which should be of Brass, and the Tongue hanging upon its Axis, the End of the Iron Screw, and the Notches of the Spindle. This Spindle is kept from moving Endways by Wreaths, in the same Manner as the Axis of a Wheel-barrow.

We have next represented the Outside of one half of the Brass Seed Box: and after that one half of a Brass Turnip Seed Box, lying with its Inside uppermost; and afterwards the whole. And we have there given the Spring Cover and the Setting Screw separate: we have afterwards shewn the Counter Screw and the Brass Spindle, in which Place we have represented the Manner of its turning.

In these Figures we have endeavoured to explain to the Farmer what is meant by the Seed Box, and its several Parts, as they may be named separately or entire in the succeeding Chapters. The Workman will also have a general Idea from them, and if he have been accustomed to Things of that Kind, will not find it difficult to execute one from these Parts seen distinctly, and the View of the whole. But as the greatest Nicety and Delicacy is required in the constructing those several Portions, and putting them together; we would advise the Workman who has never made one, to refer himself to the several Cautions and Directions given at large by Mr. TULL, in his Horsehoeing Husbandry; we write to inform the Farmer, not the Mechanick, and must not trespass too far upon the Plan we have laid down to ourselves in the first setting out of our Work. We cannot, within the Compass of our Intention, expatiate farther on the Structure of this Instru-



Instrument, but hope the Figures, which save so many Words in the Description, will be sufficient for the Purposes to which they were introduced.



CHAP. LVIII.

*Of the Wheat Drill, and Turnip Drill.*

HAVING, in the preceding Chapter, described the Nature of the Seed Box, in this Method of Husbandry, we shall here shew its Use, and the Manner of connecting it with the Plow, Hopper, and Harrow, for the immediate Service in the Field: first instancing their particular Structure as appropriated to the sowing of Wheat.

We have represented this Instrument entire in a Figure; where the Situation of the Seed Box last described, and of the Harrow mentioned in a preceding Chapter, are explained to the Eye, and their Uses evidently shewn.

The Plow represented there, is one calculated for drilling Wheat in treble Rows. These Rows are placed at seven Inches Distance, and the Harrow which moves on its Beams covers the Seed in the same Operation.

The Plank represented in the Center of the Figure, should be, for this Purpose, three Foot and a half long, eight Inches and a half broad, and one Inch and a quarter thick. And its upper and under Surfaces must be true Planes. The two Beams of the Plow are to stand directly under the Plank, and must be held up to it by Screws with Nuts. These are to be two Foot four Inches long, two Inches and three quarters broad, and two Inches and a Quarter deep.

This Plow makes its Channels by Means of three Sheats, which have their Shares and Trunks. The first or foremost of these stands under the Middle of the Plank, and to shew its proper Structure we have added a Figure of it separately. It is placed obliquely, and pointing forwards in the Plow, that it may be out of the Way of the Funnel. It should be an Inch thick on the upper Part, but the rest of it need be no more than the Thickness of the Share. We have singly represented also a Share lying Bottom upwards; we have also represented separately one Side of the Trunk, which is a thin Plate of Iron, and is very well made out of the Blade of an old Scythe: this is to be riveted on to one Side of the Sheat. And after this the Trunk entire, which is formed by this Plate, and such another on the opposite Side.

After this we have represented separately one of the hinder Sheats.

The Figure of this cannot be mistaken, and its Situation in the Plow is at one of the Beams, as the other is at the other. They are both fastened into the Beams by their Tenons, which are driven into a Mortise made for that Purpose, and fastened by a Pin passing through the Beam.

The Figure will shew the Workman how he is to make these, but it may be proper to caution him not to make the Tenons across the

Grain of the Wood; but to chuse for this Purpose a crooked Piece of Timber.

These Things being understood, of the Parts and their Structure, we may continue the Consideration of the Plow as represented together: The fore Sheat being fixed up at equal Distance from each End of the Plank, and as near as can be to its hinder Edges, the Funnel has Room to stand with the fore Side of its Hole to make one Surface with the Back of the Sheat: and the hinder Part of the Trunk does not reach the Edge of the Plank. The Fore-Standard must stand perpendicular to the Plank across the Tenon of the Sheat.

This Standard being thus close to the fore Side of the fore Hopper, there must be so much Room between it and the Hole of the Funnel; that the Seed may drop from the Seed Box into the Middle of this Hole.

The two hinder Sheats must be placed at equal Distance from the Sides of the Beams, and so near to their hinder Ends, that there may be Room to make the Funnels in them, and their Tenons to come up between their respective Funnels and Standards; these Standards also must be set perpendicular to the Beams. The Beams must be placed at such Distance from one another, that the Shares may be fifteen Inches asunder, from the Inside of one to the Outside of the other; and the Shares must be all parallel to one another, and to the Beams.

This being the Structure of the Drill Plow, the Channel or Trench that is made by the Middle, or fore Share or Sheat, being at an equal Distance from the two hinder Sheats, is filled up, and the Seed is covered in it by them; and the Seed in the Trenches made by the two hinder Sheats, is covered by the Harrow, which is fastened to the Beams of the Plow, and has two Tines placed just at a right Distance for that Purpose: of this we need not give a farther Description. Its Figure and Situation behind the Plow represent it sufficiently, and we have had Occasion to describe it before, among the other Kinds of Harrows.

The Funnel rises two Inches at the Edges from the Surface of the Plank, and is five Inches square at the Top; and its Hole at the Bottom is continued quite through the Plank, into the Trunk that is underneath. This Hole is square: Its Opening for Wheat and other Grain, is to be three quarters of an Inch; but when Pease, Oats, or other large Seeds, it may be made an Inch square, and it is to be a little wider at the Bottom than the Top. The other Funnels are to be made exactly like this. They cannot be so deep, because they are cut in the very Beams, but their Width at Top is encreased by adding on each Side a Piece of Wood, so that they are each an Inch and quarter wider than the Breadth of the Beam. The upper or fore Side of these Trenches must not rise so slanting as the others, because that would bring them too near the Tenons of the Sheats.

Across the Plank of this Plow, near its Edges, there lie two Pieces of Wood: these are each eleven Inches long, two Inches broad, and two thick. They are fastened by Screws and Nuts, and stand parallel to the other Beams. Each



of these have a double Standard or Fork, perpendicular to the Plank, and by these Standards the fore Hopper is drawn and guided.

Having thus far examined the Nature and Make of the Plow itself, which could not be so well comprehended in a Figure, if drawn entire with its Hopper, we have represented it again in that perfect Condition, fully fitted up, and ready for Work. In this and the other Figure seen together, all the Parts may be very plainly distinguished.

The fore Standard, which rises from the Front of the Plank, is to be two Foot long. Its Breadth is to be two Inches in the narrowest Part, and it is to be half an Inch thick in the thinnest, and two Inches at its Shoulders above the Plank. We have represented it separately, and it will be so seen in what Manner it is pinn'd through the Plank before the Funnel. It holds the fore Hopper from turning upon the Spindle. It is put through a Carrier like that of a Door Latch, which is nailed on the upper Part of the fore Side of the fore Hopper. In this the Standard has Room to play, or move Sideways, that either Wheel may rise up.

We have represented separately also a hinder Standard, which being placed perpendicularly in the Beam, is fixed in a Mortise, and pin'd into the Beam. It has a Shoulder behind, another before, and a third on its Outside, and these serve instead of Braces to keep it from moving backwards, forwards, or outwards. This is two Foot four Inches long, two Inches broad, and an Inch thick.

The two hinder Standards are made just alike except for their opposite Situation, their Use is to guide, draw, and hold up the hinder Hoppers, which are represented in the Figure where this Plow is shewn compleat, in their Places. They are to stand upright, and in the Middle of the Beams, and at such Distance before the Funnels, that when the fore Side of the Hopper, by its whole Length, bears against the hinder Surface of the Standards, the Seed may drop into the Middle of both Funnels.

The Shafts, or Limbers, are represented in both Figures, they are to be fix'd down to the Plank, each by two Screws and Nuts, and they are kept at a due Distance by the cross Bar, which runs from one of them to the other, at a small Distance from the Plank. These Shafts must be so placed that the Path of the Horse is strait with the Center of the Plow, and then it will follow in a direct Line.

The Use of the Trunks in this Instrument is for making the Channels narrow. Without Trunks these Channels must be made with Ground Wreaths, which spread the Sides of them wide; but these Trunks make them narrow of whatever Depth.

We have represented separately one End of a hinder Hopper laid open, the middle Part is cut out to give a closer Sight of the Plow and fore Hopper. The whole Hopper is represented also separate and entire; as also a Hopper with its Standard, Spindle, and Seed Box. By these Figures the entire Mechanism of this Instrument will be understood. At the Bottom is seen one

End of the Spindle passing through the Hopper and Seed Box.

The bottom Board of this Hopper, which holds the Brass Seed Box, should be four Inches broad, and full half an Inch thick. And at each End it must be a quarter of an Inch longer than the Seed Box. We have also represented separately the two Sorts of Wreaths, which are screwed upon the Spindle to keep it from moving towards either End, as well as to hold the Hoppers in their Places, one Kind may be made of Wood, the other must be of Brass, and is greatly preferable in all Respects.

When the Plow is all together, as in the Figure where it is represented entire, the fore Hopper shews itself very distinctly; it is seen with its Seed Box standing on the fore Funnel: this is larger than the hinder Hoppers, but there is no more than the same Quantity of Seed to be put into it, when it is used.

As to the Wheels of this Plow, the Diameter of the fore ones is to be thirty Inches, and that of the hinder ones twenty-two; and their Spokes are to be made strait, so that they are not hollowed in the Manner of other Wheels.

Thus have we represented to the Eye this complicated Instrument, and explained its Parts by a few plain Words. A Volume might be written upon it; but by this the Farmer will understand enough of its Operations, and the Plow-wright of its Form.

This is the Drill for Wheat, and the little Variations necessary to be made in it for other Seeds will easily be comprehended. However, we have added the Figure of the Drill Plow for Turnips, that the general Difference may be seen. The Funnel, Sheat, Share, and Trunk, which are the essential Parts for the Work, are the same as in the Wheat Drill already described, with very little Variation; and the Instrument is the less complicated, because it is to sow but one Row, not three at a Time, as is done in Wheat, which made the Necessity of three Hoppers, and, in a Manner, of a treble Apparatus, which is in this Case single.

He who understands the more complicated Kind, will find no Difficulty in comprehending every Part of this, the principal Difference of which is, that it is single. The Shafts in this are to be light, and the Bar is to be about three Inches distant from the Plank. The Plank should be two Foot and an Inch long, five Inches broad, and an Inch and quarter thick; and the two Pair of Standards placed into the Plank, with Shoulders above, are to be thirteen Inches high above it. The Beam of the Plow is to be two Foot two Inches and a half long, four Inches broad, and two Inches thick. The Funnel is to be two Inches deep, and four Inches square at the Top. The Harrow follows in its Place, and the Tines are made of Wood: and they are to stand eight Inches asunder at their Points, and six Inches and a quarter at their upper Parts, just under the Harrow Head. The Hopper of the Turnip Drill consists of a Box placed in to the Middle of a Carriage, we have represented this separate, that its Figure may be more distinctly understood; and afterwards the Carriage in the Middle of which it is placed.

The



The Circles of the Wheels of this Hopper go five and twenty Inches asunder.

The double Standards are used on a Level, and not otherwise. We have therefore added another Figure of the Turnip Drill Plow, entire and fit for working without them.



### CHAP. LIX.

#### *Of the Hoe Plow.*

WE are aware that this Description of the Instruments will appear tedious to some, and that it will be said, as there are People enough who know how to make them, why should their Parts be described here. Others have bestowed many Sheets upon them, where we have comprised what we thought needful to be said in a few Pages. But something beside the bare Figures we thought necessary, because we would have every Farmer entertain at least a general Knowledge of their Nature; and because we otherwise should not have been understood in the succeeding Chapters, when we come to name their Parts, in treating of the Manner of using them.

We have gone through the most complicated, and longest Detail, in the Article of the Drills, the Reader will give us his Indulgence while we explain, in very few Words, the Hoe Plow, or Horsehoe, which is an Instrument much less compounded, and much easier understood.

We have given a Figure of the Hoe Plow entire, and the Reader who is already acquainted with the Structure of a common Plow, and the Names and Uses of its several Parts, will be at no Loss to understand this.

The Beam and Tail are very like those of the common Plow. Indeed the Resemblance is so great, that the Beam of a common Plow being cut off, and screwed up to the Plank of this, with its Shafts tight, make a good Hoe Plow.

But to make a Hoe Plow perfectly and properly, it is better to set about it entire, and for that single Purpose. The Share, from its Tail to the

fore Part of its Socket, should be two Foot and one Inch long, and from thence to the End of the Point, ten Inches and a half: this is the proper Measure of its under Side. The Length of the Plank should be two Foot seven Inches and a half; it should be nine Inches broad, and two and a half thick. The Shafts are to be screw'd to the Plank, in the same Manner with the Beam. And the Draw Pin, whose Nut is seen in the Center of the Plank, is to have a Crook underneath, to which one of the Links of the short Chain of the Whipper is fastened. The under Surface of the Shafts runs on a Level with the Plank, and they are to crook outwards till they come within a Foot of the Chain, these Shafts must be strong and well made. The Notches in the Ends of the Whipper, serve to fasten the Traces of the Horses. And the shorter the Shafts are from the Bar the better, so they are sufficient in Length for their Purpose.

This Plow is a very plain and very excellent Instrument. It is set to go deeper or shallower, by changing the Links of the Chain of the Shafts which lay hold of the Crook. This has the same Effect in the Hoe Plow, as the changing the Pins to different Holes of the Crow Staves in a common Plow. We have represented separately the Beam, with its Mortise and Holes; and the Plank which, by its Holes and dotted Lines, shews the different Manner of placing the Beam. The four Holes near the Ends, are for screwing down the Shafts.

There are usually nine Holes in the Plank, for changing this Situation of the Beam, that the Plow may fallow in a right Path. The Holder may also make some Alteration in the going of the Plow by the Handles.

After thus representing the Instrument, we have shewn it at Work; where the Manner of fixing the Horses is seen. This Instrument therefore being, in this Manner, explained, we shall enter upon its Use, together with that of the Drills before described; that is, on the Practice of Drill and Horsehoeing Husbandry for the Service of which these Instruments have been invented.



## BOOK VI. PART VI.

### *The Benefit of Drill and Horsehoeing Husbandry, shewn in three Sorts of Crops.*



### CHAP. LX.

#### *Of raising Turnips by the Drill and Horsehoeing Husbandry.*

AS we have now laid down the Theory of the Drill and Horsehoeing Husbandry, and described the Instruments by which it is to be performed, we shall in this, and the two succeeding Chapters, reduce that Theory to Practice,

and shew the Use of the Instruments in the Field.

We shall chuse for the Instances of the several Methods of practising it, Turnips, Wheat, and Saintfoin: the most useful Root, the most valuable Corn, and the finest of the artificial Grasses.

Each of these we shall mention separately, and the Reader will recollect that, according to the Course laid down in our Plan, they are to be treated of generally in a succeeding Part of our Work,



Work, among other Roots, Corn, and Grasses, they are here considered only as Instances by which to shew the Practice of this particular Species of Husbandry and its Excellence.

Turnips are of several Kinds, and distinguished by different Names, according to their Shape and Colour, but the principal Sorts that the Farmer has to do with, are the common round Turnip, the long, or SUFFOLK Turnip, and the yellow Turnip.

He plants these for the Food of his Cattle; and though it is but of late that this Root is got generally into the Field, yet the Advantage of cultivating it is so very great, and so very well known, that there is no Article in the Farmer's Profession better worth his Regard; and there is nothing in which he may have more Benefit from the Drill and Horsehoeing Husbandry.

Turnips thrive best in a light warm Soil: for this Reason they particularly fall in the Way of this Kind of Husbandry, because it is on such Land it is best practised. The common Method is to allow two Pounds of Seed to an Acre, and to sprinkle it on with the Hand.

They are sown at two Seasons. In Spring to produce Seed the same Year; and at Midsummer for the Food of Cattle in Winter.

Those sown for Seed are few in Comparison of the others. A Part of the Seed is used for sowing again, and the rest is mixed with Coleseed to make Oil.

In order to the Midsummer sowing, the Land is to be plowed in MAY, and twyfallowed in JUNE to make it fine, the Seed is then to be harrowed in; and thus they are raised in the common Method, and are ready for the Cattle in the Depth of Winter, and the Beginning of Spring.

In this Way of raising them they are very liable to be devoured by the Fly, and the Ground is to be often sown over again.

When they come up too thick the Practice is to thin them with a Hand Hoe.

This is the whole of the Farmer's Practice in the common Way for raising of Turnips, but this is subject to many Inconveniences: we shall now shew the Method by the Drill and Horsehoe, which will be the better understood, and its Advantages the plainer seen, after this Account of the raising them in the other Way.

That the Farmer who shall try this Method upon Turnips may give it fair play, let him first fix upon a Field that has a proper Soil. The most favourable Land of all is such as is light, sandy, warm, and a little moist. On the contrary the worst is Chalk; but with good Culture they may be raised any where. If the Soil be shallow neither Turnips, Carrots, nor any other large-rooted Plants, will succeed so well as when it is deeper: and as the Soil nourishes Plants in a great Degree, according to the Care that is taken to break and divide it: this is another Reason why Turnips have a great and particular Advantage from this Method, because none stirs or breaks the Earth so thoroughly, or so deeply.

For this Reason, when a Piece of Ground is intended for Turnips, of whatsoever Kind it be, it should be first plowed up as deep as possible, and then, as thoroughly as possible, broken and

divided to fit it for their Nourishment. If the Soil be in its own Nature light, this will do; but if it be a tough and heavy Piece of Land, other Methods are to be used to reduce it to Fineness; for unless that be done effectually, so that it may be kept fine, the Turnip will never arrive in it at its due Perfection.

Those who would have Tillage answer the Place of Manures, will recommend nothing more in this Case, than the thorough breaking and dividing the Land by working; but we do not write to serve a System, but to serve the Farmer. Therefore although we are, in this Place, recommending the Horsehoeing Husbandry, and proposing the Excellence of it in raising of Turnips, yet we shall advise the Husbandman to add, in Case of this tough Soil, the Benefit of Manures.

Let him lay on these in their proper Kinds, and in the due Quantities, as has been directed at large in the Account of Manures in a preceding Part of this Work. When he has, by this Means, converted a heavy Soil into a light one by the due Use of Manures, let him go to work upon it for Turnips with the Horsehoeing Tools.

To give an Instance of what we mean. Suppose a Farmer has a Necessity of raising Turnips, and has nothing but a clayey Soil: in this Case Turnips will not thrive upon it, because it is cold and tough. Let him throw on good River Sand, this will make it a Kind of Loam, in which State it will be lighter and dryer; and when he has made this Change in it, let him go to work and prepare it for his Turnips. The Horsehoeing Husbandry, with the Assistance of this Manure, will produce them in great Perfection. Whereas it would have done it but poorly without.

There may be other Soils which have a Necessity of other Kinds of Manures, according to what has been before written on these Subjects, and in these Cases let the Farmer act just as in the present. Let him first improve his Ground by the necessary Manures, and then proceed to the preparing it for this particular Growth. The Success of his Turnips will make ample Amends for all his Trouble and Expence, and so he will find it in every other Kind.

For this particular Article, if his Land be light, it is fit for the Growth: if it be not, he must endeavour to make it light by Manures and Tillage; and if he have not Convenience of getting as much Manure as he could wish, he must make up the Deficiency by so much the more Tillage.

The Season of sowing Turnips for the Winter Service, is properly from the End of MAY, to the Beginning of AUGUST. The warmer the Soil the later they may be sown; but in such as want that Advantage, it is best to be early.

The great Disadvantage of chalky Soils for Turnips is, that they grow slowly: and this, in their first Stage, is very destructive. The Turnip, before it gets its rough Leaves, is the Prey to many Insects; and as it is longer in chalky Soils than in others before it gets them, there is the more Danger. This Plant grows much quicker in the new Method than in the old, and there-



therefore it is one of those that have the most Benefits from it.

The sandy Soils being warm make the Turnips grow fast, so that they are sooner out of this Danger: and the Horsehoeing makes the Earth imbibe and receive the Dews so plentifully, that there never wants Moisture to the Roots, so that they are always in a Condition of growing with Vigour.

In the new Method an Ounce of Seed sows as much Land as a Pound in the ordinary Way. In that Way the Turnips rising at Random are, in a great Measure, to be cut up, but in this all the Seed that is sown is for good.

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#### C H A P. LXI.

##### *Of the Disposition of a Turnip Crop.*

**T**HE Turnip being a large-rooted and strong Plant, should be sowed by the Drill Plow in single Rows. We have shewn the Instrument which is to perform this; and Experience proves that the best Distance for these Rows is six Feet asunder. These large Intervals will appear a great deal of waste Ground, but we have shewn already that the Turnips have the Advantage of it all; and they will evidence it by their Growth much better than we can by Words.

Turnips have been tried in double Rows, but they do not succeed so well, Mr. TULL made the Experiment, but found it unsuccessful. He also sowed them in single Rows, with only three Foot Intervals, but that did not answer so well. He found that a Field sowed thus, produced a much larger Quantity of Turnips than a neighbouring one of the same Extent, which was sown and hoed in the usual Way; but its Produce was not comparable to that of the single Rows, with six Foot Intervals. When these Intervals are well wrought by the Horsehoe, and that to a good Depth, the Plants grow in a surprising Manner, and never suffer by Drought; the breaking of the Earth making so fit for the Reception of the Dews, that it is always moist.

In LANGUEDOC they have only four Foot Intervals between their Rows of Vines in their Vineyards, and they break the Earth between with a Hoe Plow drawn by Oxen. This has led them in that Country, where they very much use the Horsehoeing Husbandry at present, to make the Intervals of the same Breadth: but their Turnips, by their own Account, have not come up nearly to the Size and Perfection of those raised in ENGLAND, with six Foot Intervals.

According as the Season promises to be dry or wet after the drilling, the Seeds should be let into the Ground at a greater or lesser Depth. When there follow Showers the Seed will grow, though but just covered with Mould; but in a dry Season nothing assists the Shooting so much as the Seeds lying at some Depth, because there it is in the Way of some Moisture, that Part of the Earth never being so burnt up as the Surface.

A great Advantage of the Drill Method is, that the Seeds may be let into the Trenches at  
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different Depths, so that whatever be the Season some will be sure to rise. When the Seeds are thus lodged alternately shallower and deeper, it is always found that if there follow Rains, the shallow Seed is the first that shoots; but if it be dry Weather, that is up first which lies the deepest.

There is a great Advantage in having two Shootings of the Turnips in the same Field: we have observed that no Plant is so liable to Accidents when young, and by this Means, if one Crop should be destroyed, there is another safe perhaps, without the Trouble of a fresh sowing.

The same Advantage may also be obtained by sowing a Mixture of old and new Seed, for the old is much longer before it comes up than the new.

The Farmer who understands the Nature of the Insect that devours the young Turnips, will very well comprehend this Advantage; but to others it will need some Explanation: The Creature that does the Mischief is a small Fly. This comes in Clouds in innumerable Multitudes, and wherever the Swarm settle they eat away down to the Root, and destroy the Produce. When they have done this Mischief they go away, and it is perfect Chance whether they come again just at the rising of the second Crop.

It is only while the Turnip is very young that it is liable to this Mischief, and there is no Probability that two Swarms of these Creatures should come each just at the Time when there is the Danger. If they keep away till the rough Leaves come the Crop is safe; and this, according to the present Method, is in a very little Time. The two Seed Leaves which are smooth, thick, and juicy, are the Food of these Flies, and no other Part.

When the Season is favourable, when all the Seeds have shot, and no Mischief has been done by Insects, the Number of Plants will be too great. Precaution has been used to sow more than need grow, because it is natural to suppose some will be lost; but when all rise they must be thin'd.

The sooner this is done the better. The Method is to pull up the worst looking Shoots, and most where they stand thickest; it is idle to let these stand to exhaust the Earth first, so that the earlier they are destroyed the better.

As to the Quantity to be pulled up, that will be determined by the Number that have risen. The Turnips that are left should stand at about ten Inches Distance. They will thus look thin while they are young, but they will soon seem thicker by their Growth.

When the Turnips have got some Bigness in Leaf, the Hoe Plow is to be brought in to plow up the Intervals. They may be wrought two and two if the Crop grow well. This gives them their Food from the new broken Earth moderately, from time to time, and it is better than to give them a great deal at once, and then leave them a great while without any Refreshment. This alternate plowing of the Intervals is best for those Plants, of whatever Kind, that are sowed in single Rows. But with all its Convenience and Advantage, it does not destroy the Weeds so well as plowing all in a regular Man-  
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ner, and at once. Therefore, when the Weeds are very rank that Method is preferable.



## C H A P. LXII.

### *Directions for horsehoeing of Turnips.*

**I**T is a great Advantage to make the Plow come as near the Rows as may be, without damaging them: and this may be done much closer when they are young than afterwards; when they are hoe plowed afterwards, and some Earth is necessarily left near the Rows unbroken by the Plow, a Man should be employed to go and turn that by Hand, with a Hook or some other Instrument. The loosening of the rest of the Ground will make this break so easily, that a good Labourer will do a great deal in a Day, and 'tis a vast Advantage to the Crop; this is a much better Method than to bring the Hoe Plow near them when large.

For many Plants, when drilled in single Rows, the Method of working the Intervals alternately is very right, and where the Weeds do not make the other Method necessary, it is very eligible. Two Plowings in this Manner are only the Expence of one, and the Benefit is commonly sufficient. The Plant that has abundant Nourishment from one Side, may dispense with its being more sparing on the other; and there are other Reasons yet for this Practice. If the Plow, by coming very near the Plants, have cut and broke too many of their large Roots, 'tis only on one Side, and those on the other Side will take in a sufficient Supply of Nourishment, till new ones are pushed there in the Place of others. The Ground being firmer, we may, in that Case, carry the Plow nearer to the Turneps without Danger of loosening them; and finally, when the Crop is large the Plow goes more readily to the Supply of first one Parcel and then another; if all have less Nourishment at a Time none are long neglected.

While the Turnips are small, great Care must be taken that a Furrow is not left open near them, because the Earth about them would become too dry; but when they have three Months Growth, and the Season is advanced to Autumn, there is no more Hazard from this Article, because not only they are grown stronger, but the Earth naturally becomes more moist. When the Frosts set in, the same Caution should be observed, not to leave a Furrow open near them, lest they should, by that Means, be put more in the Power of the Weather.

The Season in which they are sowed will, in some Measure, determine whether the Intervals are to be plowed alternately or otherwise. If the Turnips have been sown late this Method will do, but if early the Weeds will grow fast, and the other Method of plowing them all in a regular Manner will be necessary.

It is surprising to what a Bigness Turnips will grow, by this Method of Culture. Seven or eight Pound Weight is not an uncommon Thing for a whole Field, one with another; and in very good Land, when the whole Practice has been rightly conducted, 'tis common to see them of

fifteen Pound Weight or more singly. The Produce of an Acre of Ground thus planted with Turnips in single Rows, with six Foot Intervals, is easily computed, and it will astonish any one not used to see the Effects of the Horsehoeing Husbandry.

The great Use of these Field Turnips is to supply the Cattle with Food in the Depth of Winter and in Spring, till the Grass gets some Strength. For this Purpose, as they are only pulled up as they are wanted; they often must stand till the Season of sowing Corn is advanced too far, or is absolutely over. This is a very reasonable, and a very great Objection against the Turnip in the common Way, but in this Method of the Horsehoeing Husbandry it is none. The Ground in the Intervals may be sown: the Turnips may stand as they are most useful, and they will get nothing but fresh Advantage from the repeated Tillage of the Ground in the Intervals.

The very plowing for the Sake of the Turnips, has kept the Intervals in excellent Order, and they may be sown in the Middle with Corn in treble Rows, at the Distance of seven Inches, Row from Row; in which Case there will be sufficiently broad Intervals between them, which, when the Turnips are all taken up, will be ready for plowing for the Nourishment of the Corn.

Cows are very fond of Turnips, and they encrease their Milk. Sheep also eat them very greedily, and they are a wholesome Nourishment for them: but Sheep should have them while young, else they do not so well take to them.

Handhoeing of Turnips, which is all that can be done according to the common Practice, is but a very poor Method at best, and it is generally so slighted over, that the Farmer is extremely cheated. The Hoers, instead of breaking all the Ground, tear up the Surface of one half, and draw it over the other, covering the Weeds with it, instead of hoeing them up: so that, instead of being destroyed, they are only made to grow the stronger.

Drilling upon the Level was the first Practice with Turnips, but it is a very bad Way. When they are drilled on Ridges the Hoe Plow may come near the Ridges, and go deep without Mischief, but in the other Way the young Turnips are often buried by the Earth falling over on the left Side of the Plow. Turnips planted on Ridges, at six Foot Intervals, have been found to yield double the Quantity with those planted on the Level, with three Foot Intervals: and when every other Article is the same, the Produce is found, by repeated Tryals, to be much greater from the six Foot Interval, than the three Foot.

The best Method of sowing by the Drill, is to let half the Seed fall into the Bottom of the Trench, which is to be four Inches deep; and the other half over it, at about half an Inch Depth, lying upon the Earth that has fallen in upon the other: and if half new and half old Seed be mix'd, as before hinted, and the drilling performed in this Manner, there will be no less than four different Shootings one after another; so that there will be four Chances instead of one, of their escaping the Mischief of Insects. It is



lucky for the Farmer, that as Turnips are liable to this Accident, the Seed is so suited to the Purpose of preventing it. For Turnip Seed will bear to be buried very deep, and come up well; and by this Method of mixing the Seed, and sowing at two Depths, there will be new Quantities rising for a Fortnight together.

If all these Chances do not prove sufficient, the young Turnips may be hoe plowed when they are in the greatest Danger, which will bury a great Part of the Insects; or at the worst another Row may be drilled in, without doing any thing more to the Land.

When the Land has been well prepared, and made very fine, the Roller may be used with a great deal of Success, upon a Turnip Field sown by the Drill. We have mentioned already, in our Account of that Instrument, the great Advantage the Farmer has from it in the destroying Insects; and there is no Kind that it more perfectly kills than these little Flies and their Brood, which prey upon the Turnips.

The Farmer often has Recourse to his Roller in the common Way of Husbandry, when he sees there is Danger from the Fly; but in destroying the Insect he spoils his Crop: for it makes the Ground so hard, that the Turnips, which require a loose light Soil, cannot thrive in it. But in the Drill Way there is no Danger. The Ground may be rolled for the Destruction of the Insects, and the Hoe Plow will sufficiently break it up, and loosen it again. The right Method is to roll the Land across the Ridges, after it is drilled. The Turnips may be after this thinn'd at a small Expence, by Hand Hoes; and the Hoe Plow will then work wet or dry, and if they have been stopped a little in their Growth by the rolling, they will presently revive and recover after this Practice.



### C H A P. LXIII.

#### *Of the Quantity of Seed, and Advantage of the Crop.*

**I**N general three Ounces of Seed, or between three and four, is the right Quantity for an Acre of Ground, sometimes two Ounces will do: and in the usual Way, although we have mentioned two Pound, many use three or four.

The Farmer may leave the Ridges, when the Turnips are drill'd in single Rows, with six Foot Intervals, higher than he can for double rowed Crops; because there will be more Earth in the Intervals.

When the Turnips are planted in six Foot Rows, Wheat may be drilled between them; and in the same Manner Turnips may be drilled in between Rows of Barley, and Rows of Oats very successfully. In these Cases, the poorer the Land is, the wider should be the Interval.

When Wheat is sown between Rows of Turnips the Method is this. At MICHAELMAS, when the Turnips are full grown, a Ridge is to be plowed up in the Middle of every Interval, and the Wheat drilled on it: and then the Turnips

are to be pulled up toward Spring, and carried to the Cattle.

In the thinning of the Turnips Regard must be had to their Appearance, and those well growing ones which the Farmers call Master Turnips, must be left two together, if they happen to stand so, leaving the greater Space on each Side of them. But if three grow together the middle one should be pulled up.

When Turnips have been sown late, the alternate Hoeing described before, will sometimes do; but for such as have been sown early it will be necessary to hoe them again. The best Instrument for breaking the Earth left about the Edges of the Rows by the Hoe Plow, is what they call, in some Places, the Prong Hoe; this has commonly two, sometimes three Teeth, and that with three is best: but this Instrument must not be used till the Turnips are of some Growth.

When the Intervals are hoed alternately, the Plow may go deeper and nearer the Row, because it is supported on the other Side, but this is only to be done when the Plants are small: at that Time it is very beneficial, but afterwards it would be dangerous. At the last Hoeing it is a good Method to leave a broad deep Trench in the Middle of each Interval.

The Crop of Turnips has a vast Advantage when raised this Way, over those by the common Method of sowing, in that they are better able to bear a dry Season. The Hand Hoe does not go deep enough to do any Service against this Accident, which spoils many a promising Crop: but the Horsehoe breaks the Soil to such a Depth, as said before, that it always keeps moist.

We have advised the Farmer before, to the Use of Manures for his Land intended for Turnips; and even Dung is allowed to be used for this Crop, by Mr. TULL its great Enemy, because he acknowledges that Dung and Tillage together, will divide and break the Land in less Time than Tillage alone; and this is a very necessary Article in the Consideration of Turnips, because they have so short a Time to grow.

The same Mistake may naturally happen in judging of Turnips sown in single Ridges, with these large Spaces, as we see People run into about Corn drill'd the same Way; that is, they may suppose fewer stand upon an equal Space of Ground; but here it is easy to confute the Suspicion by counting. The best Judges of Turnips leave only thirty to a square Perch when they have been sown in the common Way, but when they are drilled with Intervals of six Foot, there may be five and forty left upon every Perch of Ground, and each will be much larger than those of which there are but thirty in the common Way. This has been proved by Trials, and is a Fact against which there can be no arguing, sixty may be left in a Perch, and they will thrive very well; and allowing these only at five Pounds apiece, they will make a Crop of above eighty Quarters to an Acre.

When Turnips are drilled late, and it is upon a poor Ground, they will not be able to grow very large, and therefore the greater Number is to be left. For the same Advantages that would, in more Time, make a smaller Number grow big,



big, will support a greater Quantity of small ones, and their Number will make Amends for the Want of Size in every Particular.



#### C H A P. LXIV.

##### *Of raising Wheat by the Drill and Horsehoeing Husbandry.*

**A**S Turnips are best raised in single Rows, because of the Largeness of their Roots, Wheat is found to succeed best in treble Rows, with sufficient Intervals between one Set of Rows and another. We have seen the Advantage this Method of Tillage has, in Respect of Turnips, over the common Practice, but its Benefit with Regard to Wheat is greater.

The longer any Plant is to remain in the Earth, the more Nourishment it will require, and Wheat is three Times as long in the Ground as Spring Corn; being sown in the preceding Autumn.

The Farmer knows that it will want a great deal of Nourishment in this long Growth; and therefore he dungs his Land to give it; and never sows Wheat but on Land thus prepared, and well tilled beside. He thus gives it a great Fund of Nourishment, but it is all laid in at once; now it would certainly be better to afford it this Supply at Times, as it continued growing. This repeated Assistance cannot be given it in the common Method, but it may in the Horsehoeing Husbandry; and it is therefore plain this Practice is particularly well suited to that Kind of Corn. Reason confirms this, and it is supported by Experience, for Crops of Wheat upon the same Ground are much larger when raised by this Method, than by any other.

The Earth is prepared for Wheat in Autumn, but it is in Spring it wants most Nourishment, for then it begins to shoot; but by that Time the Ground has got almost into its original Condition again.

When the Farmer is preparing his Land for Wheat in the Horsehoeing Method, let him take Care of all Things to free it from Grass. Other Weeds may be destroyed by the Methods used in that Practice, but this very difficultly. Other Weeds may be got out when among the Rows; but Grass cannot, and it is so pernicious that one Bunch of it will spoil a Yard of the Crop.

The Ridges for the drilling of Wheat should be made strait and equal; the Plowman who understands his Business knows how, by setting up a Mark, to carry on the Line quite strait: and to make these Ridges even he needs only mark out several of them, before he begins. But if the Piece be of such a crooked Form that the Ridges cannot be plowed strait the first Time, it may be proper to drill it upon a Level, and all the Ridges for the next Crop may easily be made equal.

Six Foot Ridges, being in Number eleven on the Breadth of an Acre, they should be made lengthways of the Field, unless there be some Reason to the contrary: as if it be a Hill any thing steep. In this Case they must go up and down, whether that carry them lengthwise or

breadthwise of the Piece: for if the Ridges should go across such a Hill, they could not be well Horsehoed.

As to the Height of the Ridges, the various Nature of the Ground makes a great Difference, but as Wheat always succeeds best when it is dry, a Foot may be given for a general Height as a Medium. When they are narrow with this Height, and have a deep Furrow on each Side, the Water that Rains throw upon them sufficiently moistens the Ground for their Service, and runs off without poaching them.

The deeper the Soil is the higher the Ridges may be conveniently made, and the wetter the Land is the higher they ought to be. In shallow Soils the Ridges cannot be made so high, because there would be a Deficiency of Mould in the Intervals. But however high the Ridges are made, the Tops of them must not be so narrow and sharp for drilling of Wheat, as they are for Turnips, because the Wheat is to stand in a treble Row, whereas the Turnips do best in single Rows. And a single Row taking up less of the Breadth, may have more of the Ridges Depth, because it leaves the Interval wider.

As there is this Difference in the sowing of Wheat by the Drill Way, so there is to be a great deal in the reaping, for the Stalks are to be cut off close to the Ground. This could not be done in the common Method, but it may very well in this, because all the Plants rise regularly in the Rows together.

When this is done, and the Crop is carried off, if the Trench in the Middle of each wide Interval have been left as deep as it ought by the last hoeing, as soon as may be, the Farmer should take a common Plow to the Ground, and go as near the Stubble as he can; and turn two large Furrows into the Middle of the Intervals. This will make a Ridge over the Place where the Trench was.

If the Trench have not been left so deep as it should be, then he is to go first in the Middle of it with one Furrow; which, with two more taken from the Ridges, will be three Furrows in each Interval. This plowing is to be continued as long as the dry Weather lasts, and then the Plowman is to finish, by turning the Partitions on which the last Wheat grew, up to the new Ridges. This is usually done at two great Furrows: and these last Furrows, which complete the Ridges, may be plowed in wet Weather.

Sometimes more Furrows will be required to make a six Foot Ridge very high. Thus when the Middle of the Intervals are very wide and deep, there will require six Furrows to the whole Ridge, and they must not be small ones. The Season also, in this Case, makes a Difference, for when the fine Mould is very dry, a great deal of it will run to the left Hand before the Plow, and more will run back again to the left, after the Plow is gone past.

When such Ridges have been made for Wheat, and the Season continues too long dry for planting it, and the Stubble not thrown up, let the Farmer then plow one deep Furrow on the Middle of each Ridge, and then plow the whole Ridge at four Furrows more. This will raise it very high. This Practice stirs all the



the Earth of the Ridges, and is done at five Furrows.

This is a very important Article of the Farmer's Concern in the Drill Husbandry, but he may be guided in it with great Safety by a few general Rules. The Furrows necessary for raising of Ridges must be more or fewer in Regard to the Bigness of them. The Plowman, as well as his own Reason, will inform him that six small Furrows may be less than four large ones.

'Tis best not to plow the Stubble up to the Ridges till just before planting; especially in the early plowing, because that will hinder the re-plowing of the first Furrows, which, if the Season continues dry, may be necessary. This may be done by opening one Furrow in the Middle; or by opening two, and afterwards the Ridges are to be rais'd up again. When they are become moist enough at Top, the old Partitions being plowed up to them, they are to be harrowed once lengthwise, and then drilled.

The old Partitions must be plowed up to the new Ridges, to support their other Earth from falling down with the harrowing and drilling, which would else make them level.

The Ridges in this Way of managing Lands, greatly excel common Ridges of the same Height, because, being made upon the open Trenches, they consist of new tilled Mould from Top to Bottom; whereas the others, though as deep in the Mould at the Tops, have little of it tilled at the last plowing.

All other Sorts of Grain succeed best when they are sown at a Time when the Ground is so dry, that it can be broke into moist Parts by the Plow, but Wheat is an Exception. The Reason is, that Wheat is to stand the Severity of a Winter, and in order to this the Ground must fall closer upon it, and it does so when somewhat wet at the Time of the sowing.

As a general Rule we may tell the Farmer, that in this Method of Husbandry especially, it is best to plow the Ground when it is dry; and then let it lie till it become moist. If this does not happen under several Weeks, he should stay for such an Opportunity. But in speaking of this Dryness and Moisture of the Ground, we are to be understood as meaning in Moderation: the Land need not be so dry as to fly like Dust for the plowing; nor should it be as wet as Pap for drilling; but in a moderate Way on each Side.

Wheat is a very particular Kind of Grain. It is too tender to be sown in a dry Time, as Rye may be. It requires the Earth to lie firmly about it in Winter, to support its Roots; and it requires it should be tender in Spring for their Passage. This is seen by Experience; and there is no Way to give it these Advantages, like sowing it by the Drill, in Earth that has been well broken by the Plow, and is become a little moist; and afterwards breaking the Earth all about the Rows in Spring by Horseshoeing.

After Rain, when the Ground is of a right Degree of Moisture for drilling of Wheat, let it be harrowed with two light Harrows drawn by a Horse, going in a Furrow betwixt two Ridges. This will be sufficient in most Cases, the Fur-

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row being just broken to level or smooth it for the Drill.

If the Ground whereon the next Crop is to stand be plowed dry, the Farmer may drill at any Time during the Season for sowing the Kind of Wheat he uses in the common Method, but it is better to drill a little earlier than the Farmers sow in the common Way, than later. The Season for sowing by the Drill, in general Terms, may be said to last from Harvest to the Beginning of NOVEMBER.

When Wheat is drilled early less Seed is required than when late, for less of it will die in the Winter. The Farmer is also to consider the Nature of his Land, in proportioning the Quantity of Seed. More of the Plants will die in Winter on poor than on rich Ground, and he must therefore allow more Seed to poor Land, than he does to rich, to provide against this expected Accident.

When the Farmer has a rich Piece of Land, and drills it early, he is to use less Seed than on any other Occasion, because every Grain, in a Manner, will come up, and very few of the Plants will die: and in this Way of Husbandry, a few Plants thriving well will send out a Multitude of Stalks, and bear an Abundance of Ears: so that the Number of Seeds sown is not the great Consideration. Let the Farmer also regard, as we have before observed, the Size of the Seed Wheat: for its Number, not the Bulk, is to determine his Quantity. The smallest Grain of Seed Wheat will produce as large a Stalk, Ear, and Corn as the biggest.

On rich Land sown early by the Drill, four Gallons of middle sized Seed Wheat is sufficient for an Acre. But in general, six Gallons in the common Run of Land, is the best Quantity. A great deal depends upon this suiting the Quantity of Seed to the Land and the Season, for if the Corn be drilled too thick, it will be in danger of falling, and if too thin it will be subject more than otherwise to Blights. We mention the Danger either Way, that the Farmer may be upon his Guard, and we have given him all the necessary Rules for conducting this important Matter; a little too much, or a small Matter too little of the Seed is not so very mischievous, but we have shewn him what happens when it is much wrong either Way; and he is to take Care accordingly.

As to the Depth of drilling the Wheat; it may be done from half an Inch to three Inches; but when it is planted too deep it is in Danger of being eaten off by the Worms in Winter; this it escapes if shallow, because they do not lie near the Surface in the severe Weather.

Just when the Wheat begins to peep above the Ground, let the Farmer beware of the Rooks. They will perceive it shooting before he sees it, and that is the Time they attack it. Let him keep them off the Field for about ten Days at this Period, and all will be safe, the Corn will then be exhausted of its Flour, and they will not seek it.

The later Wheat is drilled the more it is in danger of the Rooks, for if it be done soon after Harvest, while there lies a good deal of loose



Corn about the Ground, they will not trouble themselves about that which is buried.

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## C H A P. LXV.

### *Of the Number of Rows for Wheat.*

WE have shewn the Method of plowing and preparing the Ground for the drill and horseshoeing Husbandry, and the Quantities of Seed Corn necessary under the different Circumstances for sowing it. We now come to a very material, and very important Consideration; which is, the Number of Rows that are to be allowed to the Intervals.

We have observed already, that the drill may be made to sow in single, double, treble, or other more numerous Rows, according to the Farmer's Pleasure. We have shewn that in Turneps the single Row is preferable; but in respect to Wheat, that Point is not so well determined.

Experiments have been made of various Manners; and it is from the Result of them we are to determine. Some have sown Wheat in a single Row, and left the full Interval for Horseshoeing between; others have drilled it in Multitudes of Rows, with few or no Intervals of any Space between them; but these are the Extremes, and are equally wrong. In the Make of the Drill Plow for Wheat we have contrived for the Sowing it in three Rows, which is a very good Method; but some prefer to this the Method of only two Rows; and they have in many Circumstances a great deal to advance in their Favour.

Of this the Farmer may be sure, that one of these two last Methods he is to prefer; whether it shall be that by the double, or by the treble Row, he must determine from the Nature of his Ground. If he drill in treble Rows, the Partitions must be seven Inches; if in double, they should be ten.

Where there is only a double Row, the Weeds are easier destroyed between; but then in the treble Rows there arise fewer of them. It must be allowed, that in the treble Rows Weeds are not so easily rooted up, without damaging the Corn; in the double Row there is less Hazard: therefore the Farmer will see, that if his Ground be very liable to Weeds, all other Considerations being equal, it will be best to sow it in double Rows; if it be naturally pretty free from them, it will be best in treble Rows. This is what we mean by advising him to conduct himself according to the particular Circumstances of his own Farm; and this in all Articles is very material.

In Favour of the double Row way, it is farther to be observed; that the Hand Hoe cannot work nearly so efficaciously in two seven Inch Partitions as in one of ten Inches: and the Quantity of Earth to be wrought by the Horse Hoe is more when there is only a double, than when there is a treble Row.

A less Depth of Mould on the Ridge will do for the double than for the treble Row; and this will serve as a Direction in respect of the Farmer's particular Circumstances.

Six Foot Ridges are absolutely necessary to the treble Rows, but not to the double, because

the Partition between the two Rows can be very well clear'd, and well wrought, by the Hand Hoe; and the Earth of the Interval is wrought with much more Ease and Convenience: and let the Farmer observe farther, that in deep and rich Land these Intervals between double Rows may be much narrower than they can be made with Prudence in poor Lands, especially when planted in the treble Rows. The widest Intervals of all are required for treble Rows of Wheat in poor Land; in other Respects the Farmer is to consider the richer and deeper the Soil, the less will do between the Rows; and let him take in the Assistance of Manure, to make it more rich, and then it will do in still less Quantity. He will find it best not to oppose the new Method against the old, but to join them for his Convenience.

The Management of the Hoe Plow is a very great Article; and the Farmer must take Care he employs an expert Plowman. The Intervals should never be too wide to be horseshoed at two Furrows, without leaving any Part unplowed in the middle of them; and the Farmer will find, that by making the Plank of this Plow short, and the Shafts crooked, so far as each will bear, he will be able to hoe with it in narrower Intervals than he may at first imagine, without damaging the Wheat.

When the double Row is used, there may be fourteen Ridges in an Acre; there will then be only one Partition on each that is between the two Rows; and its Breadth is ten Inches.

This Method brings the new Husbandry nearer to the old: And as we shall advise the Farmer, in all respects, to come as near as he can toward uniting them, we shall advise him to harrow the Land, after Drilling, with the common Harrow; it will cover any of the Seeds that may chance to have been left bare by the drill Harrow, and encrease the Growth.

The hand hoeing between these double Rows is very easy; but let the Farmer see that it is done properly, and not slighted over: In the doing of this, the Earth must never be turned toward the Wheat; for it may crush the Wheat while it is so young and tender, as at this Operation, and the Partition would never be hoed clean.

The Hoes for this use should have the Edge seven Inches long, and be four Inches deep from the Handle; they must be thin, and well steel'd; and this Work, at a moderate Price of Labour, may be done at about eighteen Pence an Acre, the working People finding their own Tools.

For the Wheat that is drilled in three Rows, four Inch Hoes are more convenient.

In low Ridges, when there are three Rows, the middle one is poor; in high Ridges it is as good as the others; but the Question remains, whether it is not rich at their Expence: perhaps as much is lost in them as is gained in that. Mr. TULL himself became of this Opinion, and changed at last his Method from the treble Row to the double. Whether or not he was in the Right we would have the Farmer find not by reasoning and arguing, but by Trials on different kinds of Land.

Pease may be drilled by the same Drill as the Wheat, when it is made for the double Row, only



only the Spindle should be changed for one that has the Notches a little bigger. This two Row Method for Pease is preferable to any other, because the Earth may be thrown so far upon the Pease in the second Horsehoeing, that the two Rows become one, which is very convenient. If Barley be drilled, the three Row Method is preferable to the two; but this is not proper to be followed by a Crop of Wheat, without a Fallow. There is the same Objection against Oats also, because some of their scattered Seeds will live out the Winter Rise among the Wheat, and hurt the Sale.

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#### C H A P. LXVI.

##### *Of the Manner of Horsehoeing of Wheat.*

**W**E have left the Point between the double and treble Rows undetermined, because each Way succeeds very well, and some being of one Opinion some of the other, among those who have tried: there should be more Experience to determine which is in general the best; but which ever Way be preferred in that Respect, the Practice of Horsehoeing is the same, altho' that of Handhoeing differs.

The first Horsehoeing is to be performed by turning a Furrow from the Row; and when the Weather is wetter when this is performed, the Plow may go nearer the Row, without Mischief; and when dryer, it must be carried somewhat more distant.

As to the time of doing this, it is best when the Wheat has got three or four Blades: but it should never be done till it have more than one Blade. If the Crop have been drilled early, it must be done before, or in the Beginning of Winter, according to the Condition of the Blade; but when it has been drilled very late, it need not have the first hoeing till Spring. In this first hoeing let the Farmer have a strict Eye upon those he employs, for a great deal depends upon it. Let him see that they go as near the Rows as they can do, without damaging the Corn; and as deep as they can, without going below the good Soil.

If upon looking over the Ground afterwards, he finds that the first Furrow was not near enough the Rows, nor deep enough, let him order a second Furrow to be plowed at the Bottom of the former; and if this cannot be conveniently done soon after the first hoeing, let it be done before the Ridge is turned back in the Spring. And let the Farmer remember always to have the Furrows turned up, to make Ridges in the middle of Intervals, during Winter.

Let him not be afraid of exposing his Rows of Corn to the Frosts, by hoeing off the Earth from them in the Beginning of Winter; for it is found by Experience, and there is no arguing against that, that when the Hoe has gone nearest, the Plants thrive best.

The Row in this case stands, as it were, upon the Brink of a perpendicular Ditch, and the Water therefore runs off from it; and we know dry Earth is not affected by Frost like such as is wet. The Plants are thus preserved during Winter; and in Spring the Ridge from the middle of the

Interval is thrown upon them, which is full of new Nourishment, having lain all this Time in the manner of a Fallow, altogether unexhausted.

As soon as the Frosts are past, and the Weather will allow it, let the Intervals have their second turning: this is called the Spring hoeing. The Ridge from the Middle of the Interval is then to be thrown, as before observed, to the Rows on each Side, by two Furrows, as near as can be done without covering the Wheat.

After this Spring hoeing, the Farmer is to be guided in what he does by the Circumstances and Nature of the Land, and by the Weather. The great Cautions he is to have, are never to let Weeds grow to any Height in the Intervals; and never to let any unmoved Earth lie in the Middle of the Intervals long enough to grow hard.

By these two Measures, he will be guided in his Work during the Summer; and these are to direct how many Hoeings the Intervals are to have, better than any general Rule; only let him observe, that he must never plow deep near the Rows in Summer, when the Plants are grown large; but, at the same time, let him take Care to plow as deep in the Middle of the Intervals as the Soil will allow; and let him turn the Earth towards the Wheat, especially at the last hoeing, so as to leave a deep and wide Trench in the Middle of each Interval.

This is the Method of raising Wheat by the Drill and Horsehoeing Husbandry. Whether the Method by two or by three Rows be the best, must be determined by more Tryals on Lands of different Kinds and Natures; but whichever of these be taken, the Advantage of the Horsehoeing shews itself in an astonishing manner. The Crop is vastly greater than any other Way; and it is increased by augmenting the Number of Stalks of Ears and of Grains.

The Stalks, instead of two or three, are thirty or forty from each Grain; and whereas a great Part of the Stalks in the common Husbandry do not come to ear; and of those that do, a great many have Ears very ill fill'd, in this Method, with the Advantage of Horsehoeing, all the Stalks come to ear, and every Ear is full of good Grain.

There is no way of producing a large and full Grain in the Ear like late Horsehoeing. If this be done just when the Wheat is gone out of Blossom, the whole Stock of Nourishment that it conveys is carried up directly to the Grain, and the Crop will be doubled by this Method.

It is by these Means that the Horsehoeing Husbandry produces a greater Crop than the common, from a tenth Part of the Plants; for it increases the Number of Stalks; it carries them all up into Ear; it makes the Ear large; and the Grain plump, and full of Flower. This it will always be found upon Examination to effect; and the Consequence is here very plain. Fourscore Ears have been counted upon one Plant; and there have been numbered a hundred Grains in one Ear. If the Wheat Plant be capable of this vast Increase and Product, there is an ample Field for the Improvements that may be made by any Method of Husbandry, which shall better than the others promote its Growth.

C H A P.



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## CHAP. LXVII.

### *Of the immediate Benefit of the broad Intervals.*

**W**E have observed that the Generality of Farmers are averse to the broad Intervals necessary to be left for the Horsehoeing, and the Prejudice is very natural: it seems leaving so much of their Land unoccupied. We have before shewn that this is a Mistake; but it is here that we may most abundantly prove it, arguing from Experience.

We see a Plant of Wheat is capable of a vast Encrease; and if we ask how it is to be promoted in that Augmentation, the Answer is very plain, for it can only be by giving it more Nourishment. There are two Ways of doing this, the one by making the Earth richer, and the other by allowing more Compass of it for the Roots to run in. The first Method is done by adding Dung and other Manures; the other by leaving these broad Intervals, and tilling them with the Hoe Plow. The latter Method will succeed much better without the former, than the former can without that; but they will have their fullest and finest Effect when they are used together.

To shew the Advantage however, in its fairest Light, we will at present consider the Horsehoeing Method, with the Advantage of its wide Intervals alone, and without the Assistance of any Addition.

We see then that we can, by allowing wide Intervals between double or treble Rows of Wheat, produce a good Crop with less Labour and less Seed than are needful in the common Way, and without the Expence of Dung, or the Loss of Time in fallowing. These are plain Advantages: there is no Difficulty in the Practice: and we hope therefore the Farmers in every Part of the Kingdom, where there is a proper Soil, will give it a fair Trial.

If it be supposed that the Roots of Wheat do not extend so far as half Way of these broad Intervals, we have shewn already that it is asserted upon Conjecture, and is most likely to be an Error; and even if it were true it would amount to no Objection of Weight: for this Breadth is absolutely necessary for the working of the proper Instruments; and at the last hoeing the Earth is thrown on each Side toward the Rows, and a vacant Space left in the Middle of the Interval, so that they certainly then have the Benefit of it all, and that is the Time when they most of all want it. There is, at this Time of the Growth, no Part of the Earth of the Interval distant above seventeen Inches in the double Rows from the Plants, or above two Foot from the middle Rows, when there are three. Thus far the Roots of Corn may be proved to reach, and the Earth is given them new tilled, and full of Nourishment for the feeding of the Ear.

We have said that in deep Land the Intervals may be narrower than in shallower; but still they must be wide enough for the Instruments to work in it; and if in shallow Land they should

be narrow, there would not only want Room to work, but Earth to work upon.

The Practice of Horsehoeing will supply the Place of Fallowing and of Dung; but there must be Earth for it to work upon: therefore there must be a sufficient Breadth of Interval, and a sufficient Depth: if the Intervals be so narrow that nearly all the Earth of them goes to make the Tops of the Ridges, there will not be enough to support the Plants, let it be ever so much improved by Tillage. There must be a Quantity of Land as well as Quality, for the supporting of a Crop; and as Land is cheaper than the Expence of Manure, why should not the Farmer who regards his own Interest allow it.

Weeds are very apt to grow in the Intervals that are hoed, but then they are soon destroyed. They grow readily because the Earth is greatly improved by Tillage; but as they are destroyed before they come to Seed, by the repeated plowing of the Intervals, the Damage is nothing. The Ground is not stocked with fresh Supplies of them, and they even add the Benefit of a Manure by rotting in the Ground.

It is plain that the Drill and Horsehoeing Husbandry produce larger Crops in the same Piece of Ground, than the common, and at less Expence; and it is equally certain that this Advantage arises from the thorough breaking and dividing of the Ground in the Intervals with the Hoe Plow. The Necessity of allowing these Intervals a due Breadth is plain, because the Work cannot be perform'd in them if too narrow; and because they cannot supply the Rows sufficiently, if there be not Substance or Quantity of Earth to work upon. The Advantage is certain, and the Necessity of Breadth in the Intervals is so plain, that at the same Time that we express our Wishes that every Farmer would give the Practice a Trial, we hope none will attempt it without giving this due Compass to the Intervals, because that would not be giving it a fair Trial; and the Importance is enough to bespeak at least Candour in the Experiment.

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## CHAP. LXVIII.

### *Of raising Saintfoin by the Drill and Horsehoeing Husbandry.*

**W**E shall, in a succeeding Chapter, consider the Nature and Qualities of Saintfoin: we are here giving the Culture of it by the Drill and Horsehoeing Husbandry, as an Instance of the Benefit of that Practice, and of the Extent to which it is capable of being carried in the Farmer's Profession.

The great Advantage of Saintfoin is owing to the Length of its Root. This pierces to a vast Depth in the Earth, and will therefore support a large Growth of it, where the natural Grass would be little. This is its particular Benefit, and there is no Way of raising it equal to that by the Drill and Horsehoeing Husbandry.

The driest and poorest Ground may, by a proper Management, be made to produce good Saintfoin, but the finest and best will always be had from the best Soil.

When



When the Farmer is about to raise Saintfoin, let him see to prepare his Land well for it; and then let him take Care to lay in the Seed carefully, otherwise very little of it will grow.

The Depth at which Saintfoin Seed is drilled, is a very material Consideration. In moderate Land it should be covered half an Inch deep, and in such as is very dry and light a little deeper, but nothing is so dangerous as the burying it too low in the Ground. No Seed whatsoever is so unable to bear it: but though it requires to be covered so very little, yet it absolutely requires to be covered: for if it should be left naked upon the Ground, it would not shoot at all, or will perish when it had just shot; we give the Farmer his full Cautions, and on his Regard to them will depend his Success.

The Quantity of Saintfoin Seed to be sowed by the Drill, is about a Bushel to an Acre. This allows twenty Seeds, or thereabout, to each square Foot of the Ground.

Let the Farmer be very careful in the buying of his Seed. It is often bad, and then, with all his Care, his Ground will be understocked with Plants.

The best Season for drilling of Saintfoin is early in the Spring. It is a common Practice to sow it in the Beginning of Winter, but that is very bad; and to sow it in the Heat and Drought of Summer is worse.

Lastly, in order to have a good Growth of Saintfoin, let the Farmer sow it alone. It is a common Practice to sow it with Barley or Oats, and this is very wrong: some sow it with Clover or Rye-Grass, and that is worse, it never succeeds perfectly, unless when it is let into the Ground without Mixture.

The Farmer who is used to sowing of Saintfoin, in the common Way, will be surprised at what is here said, with Respect to the Quantity of the Seed. Six or seven Bushels to an Acre is the usual Allowance in the ordinary Way; but in the single Bushel we allow in this Method, we compute for a great deal of bad among it, for a much smaller Quantity of Plants than would be thus rais'd from good Seed will be sufficient. In general there is no Crop that so well bears to rise thin as Saintfoin, for it grows larger and sends out more Branches in Proportion as it stands more single.

When Saintfoin stands the most single, in Moderation, it will yield the largest Crops. It spreads its Roots to a great Depth and Distance, and a few well nourished Plants are more than a great many that are but half fed. The common Length of the Saintfoin Stalks is two Foot or a little more; but when it stands far asunder they will grow to six Foot.

The Root of this Plant is found to encrease in Length and Thickness, in Proportion as it is farther from other Plants; and as the Root encreases the Stalks always keep encreasing. The greater the Number of Plants of this Kind there are, upon a Piece of Ground, the smaller they are; and their Number never makes Amends for this Deficiency in their Growth. When there are but a few Plants upon the Ground, they will support themselves without Assistance, and encrease every

Year in Strength and Produce; while on the other Hand, the great Number that are sometimes raised by unskilful People, while they produce less, require Manure or they will perish.

From the Nicety required in laying in the Seed of Saintfoin, it is easy to see that the Drill Husbandry is much better suited to its Produce than the common; but here is another Reason: we see that if the Plants stand too thick they are starved, and yield little; but in this new Method they are in less Danger of this Mischief, because they are sure of having Room on both Sides, though they stand thick in the Rows; if the Intervals be allowed a due Breadth: and there is no Crop which requires to have them larger.

When this Plant is kept at a due Distance, the second Crop rises immediately after cutting: but when they stand thick it does not shoot till there comes Rain. A moderate Distance is the planting about a hundred Plants on a square Perch, and these will very well yield two Ton to an Acre.

If the Farmer follow our Direction of drilling his Saintfoin Seed early in Spring, and take Care to hoe it well afterwards, he will, if the Season be favourable, have a Crop the first Summer: this he is not to expect in the common Method of Management, but this Way it will be a very pretty Addition to his Profit: and the Roots having Time to strengthen themselves in the Earth, by this early taking off the Head, will thrive the better for the succeeding Years.

On many Lands, in the common Way of Management, Saintfoin yields but one mowing Crop in a Year; but with right Management it will yield two very large ones.

There is no Plant that has more Advantage from hoeing than this. A Quantity of hoed Saintfoin will grow more in a Fortnight, than such as is unhoed in the same Land will in six Weeks; and that which is hoed will be fresh, green, and strong, while the other is poor and yellow.

From these general Observations we may lay down Rules for the Management of this beneficial Plant, which will be as certain of Success as the Experience on which they are founded is true.



C H A P. LXIX.

Of the Manner of planting Saintfoin.

THE best Method for raising Saintfoin by the Drill and Horsehoeing Husbandry, is to drill it in double Rows, with eight Inch Partitions, and with Intervals of two Foot and an half: and these Intervals are afterward to be hoed only alternately, leaving the other to make the Hay upon. The Benefit of Horsehoeing is very evident upon this Plant, for it makes it thrive excessively on very poor Land; and will cause it to yield two very good Crops, where it would otherwise have afforded but one, and that indifferent.

Less Horsehoeing is required for Saintfoin, than for any other Plant. In very good Land it may be omitted for two or three Years, but



when the Ground is poorer it must be repeated oftener; and whenever the Crop is seen to fade, this will refresh it. While the Plants are small Care must be taken not to cover them with the Plow, but afterwards there is no Danger.

We have said that the Land must be well prepared for this Plant: and we are to add, that great Care is to be taken in the whole Operation of raising it. The Ground must be made perfectly clear of all other Growths, and well broke by Tillage; and Care must be taken that the Tines of the Drill Harrow exactly follow the Shares, for the covering of the Seed.

No other Harrow is to come upon the Ground after the Saintfoin is sowed: nor is it to be rolled. Those who sow it with Barley must roll the Ground for the Sake of that Corn: but we advise the Farmer to sow it alone, and then he is not to roll the Ground after it.

Let him take Care that no Cattle come near the Saintfoin when it is young, and in the first Winter let him give it a little Manure of Soot or Ashes; this will greatly encourage its Growth, and the next Crop will very well pay the Expence.

This he will certainly find to be the Difference between drilling Saintfoin, and sowing it in the common Way, that the Expence of drilling is hardly a twentieth Part of that in sowing it the other Way, and that the Profit of the Crop is generally double.

We have observed that less Horseshoeing is necessary to Saintfoin than to any other Crop, when that Method of Husbandry is practised; and it will be proper to add here, that this Plant will succeed extremely well by the Drilling, without the Addition of the Horseshoeing Article. It may be sown for handhoeing, or for standing without any Kind of hoeing at all; but in both these Cases the drilling is vastly preferable to the common Method of scattering in the Seeds at Random.

When Saintfoin is drilled for handhoeing, let the Rows be made sixteen Inches asunder; and the Plants singled out by the Hoer to about eight Inches Distance; but let the Hoers take Care to have the stoutest and best growing Plants, though they happen in some Places to stand a little closer than the allowed Distance, leaving a Space proportioned beyond them.

When it is not intended to be hoed at all, either by the Hoe Plow, or by Hand, the best Method is to plant single Rows, at eight Inches Distance, with no greater Quantity of Seed than when they are planted at sixteen Inches. Either Way there will be a profitable Crop: but by what we have seen from Experience, the Horseshoeing and the Drill together produce the richest, the most profitable, and the most lasting Increase.

## CHAP. LXX.

### *Of the great Advantages of the Drill and Horseshoeing Husbandry.*

WE have now, in a plain and impartial Manner, laid down the Principles upon which the new Method of Husbandry is founded; the Manner in which it is to be performed; and its Effects on three different Kinds of Crops, the Turnip, Wheat, and Saintfoin. The Farmer must, by this Time, very well understand its Nature, but it may be proper to close the Account with a short Récital of its Advantages; that what Reason shews him to be right he may find will answer also in Practice.

The Farmer, when he comes to count his proposed Gain, should take into his Consideration four Things; the Expence of his Crop, the Value of it, the Certainty or Hazard, and the Condition wherein the Land will be left after it.

If the Profit of a Crop were to be computed singly from its Price at Market, that of the Drill and Horseshoeing Husbandry would have the Preference greatly over that raised by the common Method: but we are to consider also, that the Expence is greatly less; and then we shall see the Benefit in a new Light.

The Farmer may get more by a very small Crop that costs little, than by a much larger that he has been at a great Expence to raise; but in this Consideration he has both the Advantages of smaller Expence, and greater Value.

All the Articles of Seed, Tillage, Drilling, Weeding, and Reaping, with whatever other lesser Articles there may be in this Method of Husbandry, do not amount to above the eighth Part of the Expence in the common Method: therefore, were the Crop much less, the Profit would still be very greatly above that of the other: it is plain then how vast the Advantage must be, when it is as we see really greater.

When the Farmer shall impartially consider the different Goodness of a Crop, that consisting in the Quality, as well as Quantity of the Grain, he will see his Advantage in a farther Light; for he will find that Wheat, the richest of all Corn, may be raised continually upon the same Land, and that the Grain will this Way exceed, in every Respect, that raised by the other Husbandry. Not only Land will continue to produce Wheat every Year by this Management, but it will grow on Land that would not otherwise have yielded it at all, without an Expence of Manure more than equal to the Profit by the Crop; but in this Way of managing Land it will yield exceeding good Crops successively, from Year to Year, with no Manure at all; and if a small Expence be added for Manure, the Success by the Assistance of both will be surprising.

The Certainty of a Crop by this new Method is much greater than in the old; and this Article of keeping the Farmer's Heart at rest, during the Growth, is worth some Consideration. In the common Way he often suffers by the Ear being too small, by the Want of Quantity, and often from



from its being too large, by the falling. But in the new Husbandry the Ears are never too small, for the Horschoeing supplies them with Nourishment just for the filling of them, and they are much less liable to lodge, because the Stalks are stronger.

If we lastly examine the Difference between the old or common Method of Husbandry, and this, in the Condition in which the Land is left after the Crop, there is no Comparison, for in the one it is exhausted, and in the other in full Strength. A Field that, after the Expence of dunging, has borne a Crop of Wheat, is not fit to bear another, but the Crop must be changed; and when it has borne two more of an inferior Nature, all the Work must begin over again, for it is exhausted, and will not bear any Crop without refreshing at this great Expence; or else it must be recruited by Fallowing. This is the Condition wherein Land is left after a Crop in the usual Way; but in the Method by Horschoeing, when it has borne one Crop of Wheat, it is fit for another; and the two Furrows upon which the next Crop is to stand, may be plowed as soon as the other is off. No store Sheep are necessary, for there is no Use of a Fold where the Land has annually a Crop growing on it, and needs no Manure. The Farmer who follows this Method, can plow dry and drill wet, without any Manner of Inconvenience: he can sow early, because he can, in Spring, help the Staleness of the Ground by hoeing: and thus in every other Article he has a certain Advantage.

A poor Ground will produce Crops Year after Year this Way, without Manure or Rest, and they shall be all very good ones; no Decay nor Exhausting, but the Earth all the while improving.

The Success of Horschoeing is so evident in the giving Nourishment to the Crops, that there have been some who objected to it, as making the Growth too rank. There could not be a fairer Confession of the Excellence of the Practice: for that which is capable of giving too much Nourishment, may certainly be so managed as to give just enough. It is true, that when Corn is too rank it is liable to many Accidents from that very Cause; but it is in the Power of the Farmer to give it Strength and Vigour enough, without giving it too much; and it is in the most beneficial Things, that the greatest Moderation is necessary.

They say if this Method can enrich poor Land to such a Degree, as to make it bear great Crops of Wheat, it will naturally make rich Land too rank. In this Case the less of it may be used, but we have provided against such Objections already, by advising the Intervals to be smaller in rich, than in poor Ground.

There have been many Objections of the like Kind raised against this Method of Husbandry, but they are such as shew they have risen from prejudiced Persons, and such as were desirous of decrying the Practice rather than of giving it a fair Trial.

As these have been too violent against it, the Advocates in its Favour have been too extravagant in its Praise. Enough may be said in its Cause, without enlarging beyond the Truth,

and he who goes farther, hurts the Point he means to serve.

We have, as carefully as we are able, proposed the true State of the Case between the old and the new Method, and of this at least we are sure, we have written with Impartiality. We have stated the Advantages to spirit up the Farmers of our own Country to make a Trial, and would see them influenced by that, rather than by any Arguments; but the Success and Advantage with which it has been used, in FRANCE makes us earnestly desire it may have fair Play here.

If we were asked whether we think the most Advantage may be had from the common Methods, or from Horschoeing without Manure; we should answer that doubtless it is from the Horschoeing Method; but the greatest Advantage possible will be obtained by employing both together!

Having thus laid down at large the Manner of conducting the new Method of Husbandry, and the Advantages arising from it; we shall here add the Thoughts of a practical Correspondent, who has communicated them at large with Respect to the Improvement of Estates, and the Advantages of the new Husbandry; including, under that Name, the Introduction of the several Articles not used by the old Farmers, as well as the new Method of Tillage; and the Management of some particular Grains and Roots.

S I R,

The Improvement of Estates appears so plainly a general Advantage to the Nation, as well as a private Benefit to those who manage it with Discretion, that it would be superfluous to enlarge on a Point which seems in itself so evident.

For whoever encreases the yearly Value of his Estate, so far certainly encreases his own, and the yearly Riches of his Country, according to the Sentiments of a late Author, which may not be improperly applied on this Occasion; "He that makes two Chives of Grass grow where but one did before, does his Country more real Good than all the Generation of Politicians together."

To the Profit arising from the Improvement of Lands, we cannot but add, two other very important Articles in Life, viz. Health and Pleasure; both which are the natural Consequence of such Undertakings, and are so great Ingredients in our Happiness, as justly to deserve the Attention of every wise and virtuous Mind.

Some Exercise is generally necessary to preserve the Health of the Body; and some Relaxation and Amusement, are equally beneficial to preserve and improve the Faculties of the Mind.

The Poet justly says,

"The Wise for Health on Exercise depend,  
"God never made his Work for Man to mend."

And this, perhaps, is the most justifiable Pretence for our Hare and Fox Hunting, so frequently fatal directly, or in their Consequences, to the Sportsmen, and so generally prejudicial to, and so often attended with the Curses of, their Neighbours.

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And might not all the good Ends of such Engagements be easily obtained, by viewing those Improvements of an Estate, which, if discreetly managed, would be far from being expensive, comparatively with the others; be a Blessing to the Neighbourhood by their useful Influence, by a virtuous Employment of the honest Industrious, procuring a lasting Encrease of Wealth to a Man's own Family, and perpetual Encrease of Riches to our Country.

Which Article of improving private Estates seems more particularly to require the Regard of those Gentlemen, who, being debar'd by our Laws from encreasing their Estates in Land, may be the rather induced and the more inclined to improve the Value of those they are well intitled to; especially as one Pound gained this Way, is generally worth near two of old Rents, as it is scarce ever loaded with additional Taxes or Assessment.

And how fine and pleasing a Prospect must it be, to see an Estate well laid out, and in good Order, well fenced, and tenanted, and the yearly Value thereof greatly encreased, as well as the Good of the Tenants promoted, with much less Expence than a Pack of Dogs, a Brace of running Horses, a showy House, or a pompous Piece of Water, would occasion; but Custom and Fashion seem herein too much to prevail with Gentlemen, against plain Reason and good Sense.

I shall only mention, after COWLEY, one Delight more, the most natural and best natured of all others, a perpetual Companion of the Husbandman; and that is, the Satisfaction of looking round about him, and seeing nothing but the Effects and Improvements of his own Art and Diligence; to be always gathering of some Fruits of it, and at the same Time to behold others ripening, and others budding; to see all his Fields and Gardens covered with the beauteous Creatures of his own Industry; and to see, like God, that all his Works are Good.

Indeed I cannot be so sanguine as to think with that ingenious Writer, that if Persons of tolerable Circumstances served Apprenticeships to this Art, "That we should see as many Aldermen's Estates made in the Country, as now we do out of all Kind of Merchandizing in the City," yet I verily believe, that if our Gentry would turn their Thoughts to Subjects of this Nature, instead of some other Pursuits in vogue, it would save many a fine Estate, and preserve many an antient Family from Ruin; and as to the plain Lucre of it, I have known some Instances where Persons in very private Stations have gained some Hundreds a Year, by taking long Leases of uncultivated Lands, and only fenced and limed them well, and then set them out again; whilst others have paid the Purchase Money of good Estates, by the improved Produce of the Lands; and I have known an Estate sold at five and twenty Years Purchase, parcelled out in Farms at five and thirty, and some of those sold again at five and fifty, and they then brought in near five Pounds per Cent. and the Tenants then did as well as at first. Such an Improvement was made of the Value of the Farms, by only taking the Field Land into Closes by good Walls, and then im-

proving them by Lime, or by Lime and Soil, or Dung in proper Compositions.

As to the Usefulness of Engagements of this Kind to the Mind, as well as to the Health of our Bodies, I believe that I may venture to affirm, that I shall herein meet with the concurring Opinions of our best Physicians, as well as the general Practice of the most considerable Persons of all Stations, who take all Opportunities of getting into the Country whenever their Affairs will permit, of which any Person near the Metropolis may be a daily, or at least a weekly Spectator.

And whoever seriously considers that our Souls and Bodies are strangely closely united, and wonderfully reciprocally affect each other, the Truth of which every Man's Experience must surely convince him of; though it exceeds the Wisdom of the greatest Philosophers, to explain the Manner how an immaterial Soul, and a material Body can operate on, and influence each other after that surprizing Manner, constant Experience convinces us they do, and how necessary it is to preserve a proper Tone, State, or Harmony of each, in order to preserve the regular Operations of both. This will evidently shew the absolute Necessity there is, from our very Nature; to have some Relaxation from, or Change of Employment, to preserve that Health of Body, and those Faculties of our Mind, which may enable us to preserve both sound enough to perform the necessary Duties of Life in our several Stations, and constitute what we call, a sound Mind in a sound Body; which whoever possesses, in Mr. LOCKE's Opinion, wants little else necessary to the Happiness of this Life.

The Innocency of this Life, says COWLEY, is the next Thing for which I commend it, and if Husbandmen preserve not that they are much to blame, for no Men are so free from the Temptations to Iniquity. And speaking of Children being taught early to Dance, &c. he adds, But did ever any Father provide a Tutor for his Son, to instruct him betimes in the Nature and Improvements of that Land he intended to leave him?

I would not here be thought to engage Gentlemen in Husbandry, as a constant Occupation, or to expect they should hold the Plow, or fill the Dung Cart.

But can they, whose Health or Affairs require their Residence in the Country, employ their spare Hours in more useful, more innocent, or more delightful Engagements?

The Mind of Man must be employed, or will grow strangely out of Order, and these Methods of doing it may probably be of much greater Service to the young and unexperienced, than some in Years are willing to allow; at least they may amuse, and innocently engage some who want proper Subjects to employ them: and probably may serve to open their Minds, and give them such a Train of Thinking, which may lay a Foundation for, or promote such a Method of Application to Business, as may end in a solid Judgment; and if pursued with Discretion directly, or in its Consequences, may dispel the Tedioufness of many a melancholy Hour, remove the Anguish of many a sorrowing Heart, procure the



the Ease of many an unhappy Family; and lay the Foundation of establishing or continuing a Steadiness of Virtue in many an innocent, thoughtless, unguarded Heart.

If then Health, Pleasure, and Profit are the natural Consequence of Undertakings of this Nature; it may not be improper here to inquire, how they come to be so little pursued; and what Lion there is in the Way to obstruct or terrify us from endeavouring, by so easy an Application, to procure Health, Ease, Plenty, and Peace.

Now to what is before-mentioned, three Things may probably be objected.

That it is beneath the Dignity of a Gentleman, to engage in Affairs of this Nature.

That several who have busied themselves in Buildings, Alterations, and pretended Improvements, have felt fatal Effects from such Undertakings. And

Lastly, That Gentlemen are generally unacquainted with Affairs of this Nature; and consequently liable to be frequently imposed on in the Management, and deceived in the expected Success of such Projects.

To the first of these it may be answered, That we do not propose that Gentlemen should condescend to the meaner Labours of the Husbandman; but sure a prudent ordering of a Gentleman's own Affairs, can never be thought below the Dignity of a wise Man; and if the Arguments and Examples of the greatest Men in most Ages, might prevail against the weak Modes and Practice of the Moderns; that Method of Life can never be contemned, on which TULLY, VIRGIL, and HORACE, have bestowed such large Encomiums; from which Dictators have been called to the Command of Armies, and to the Pleasures of which mighty Emperors have retired from the Fatigues of Grandeur. A Life chose by SCIPIO, as mentioned by SENECA.

In this Corner that great Man (SCIPIO) "the Terror of CARTHAGE, and to whom ROME owes that it was but once taken, after murthering his Fields with his own Hands, would wash himself," for he chose to work, and tilled his Ground himself, according to the Custom of our Ancestors.

As to the second Thing objected; the ill Consequences Applications of this Kind may be thought sometimes to have produced; I believe, if those Instances were particularly enquired into, the Ill would commonly be found to arise from ill-designed, ill-executed, or extravagant Houses, Out-houses, Dog Kennels, or monstrous Gardens; an Instance of which I saw in YORKSHIRE, where a Gentleman was drawn in to spend near ten Thousand Pounds, without finishing any one wise and useful Thing; and was still pursuing the same Methods, to his Ruin, had he not been stopt by the friendly Advice of one, who thereby made both him, and his former Advisers, his inveterate Enemies: and I presume, similar Instances of Folly may also be found in most Parts of the Nation; but we cannot thence justly conclude against prudent Buildings, and useful Improvements; especially if proper Care be taken to act cautiously in new Experiments, and

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to have Trials made, and repeated in small Parcels, before large Expences are hazarded in great Undertakings.

As to the last Objection, That Gentlemen are often unacquainted with Affairs of this Nature, and for that Reason liable to be greatly imposed on, and consequently to suffer both in their Characters and their Fortunes: the Truth of this is not to be denied, without departing from that Sincerity we profess to adhere to; but at the same Time we declare it to be the principal Intent of this our present Undertaking; to provide a proper Remedy for this Inconvenience, by laying down Rules to guard the Unwary, to guide the Unexperienced, and to be of some Use and Service to all.

Improvements of Estates may be consider'd in three Views, as they arise from what I chuse to call natural Improvements; such as convenient Buildings, laying Lands commodiously together, dividing them into proper Parts, fencing them well, with Things of the like Nature; without any way meddling with the Surface or Soil, by either common or artificial Manures or Management.

Secondly, By what may be called artificial Improvements, as by Lime, Salt, or Burn-baiting, called Denshiring; and all the different Sorts of Foreign Grasses, such as Clover, Saintfoin, and many other Things of the like Nature; several of which have been treated of before particularly, and the rest will be hereafter.

Lastly, As they arise from the common or late improved Methods of Husbandry, such as dunging, plowing, and prudent managing of all Sorts of Ground, according to the present best Methods established by the most observing Gentlemen, and the most experienced Farmers, in different Counties, and on Lands of different Natures.

Now it is the first Article only which we shall at present consider, since we apprehend the Things which concern that will be the most readily understood, by Persons not very conversant in Affairs of this Nature, and will the soonest answer Expectation, where there are proper Opportunities of carrying them into Execution. Things of immediate Use to us, being of greater Consequence than the most curious Speculations in which we are less interested. PYTHAGORAS's Rule is excellent. "Search profitable Knowledge. "Whatever Time is saved, Inconvenience removed from, or Advantage gained to a Gentleman's Servants in his own Family, or to or for his Tenants or their Servants, out of it, so much additional Wealth he certainly saves or gains yearly in his Expences, or to his Estate, either directly or in the Consequences of it."

This Rule is also applicable to every Farmer and Labourer; and indeed to every Station of Life, from the Coroner to the Cottager.

But as Examples and Instances make deeper Impression than Rules or Precepts, I shall here mention a Case of my own, in a Particular of this Nature.

When I purchased the Estate I since lived at; I found a Well, with its usual Conveniences, about sixty Yards from the Kitchen Door, and when

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I had fixed a Pump there, still found the Expence of carrying Water, taking in Brewing, Washing, and other Accidentals, full half a Crown a Week: on which I laid the Water into the House from a Cistern, placed under the Pump; which was covered and contrived so, that it must be near full before the Water could flow out at a Spout, near the Top of a Cistern, before the Men Servants, or Neighbours, could have any for their Use, or receive it in under Cisterns for Horses or the Cattle to drink at. By which Means the House was generally supplied with Water, without the Servant's going out to pump.

The whole Expence was about eight Pounds, and one Pipe was laid into the Kitchen, one to the Wash-stove in the Brew-house, one to the Side of the Copper (for the Level would not carry it into the Copper, but the Water was easily laded into it, out of a Tub which stood under a Cock close by it) and another Pipe was laid into the Garden, to water that.

I presume, I need not mention the Ease and Saving this one Article procured, besides the Water's being better and fresher this Way, than the other.

And I believe proportionable Advantages will be found in most, if not all, the general Improvements after-mentioned.

Every Farmer will find the Difference of milking near Home, and at a Distance; in one Place only, or in different Pastures.

And every good Oeconomist will contrive his Affairs, as far as he can, with Prudence, so that what is most wanted should be the nearest, and those at the greater Distance which he, or his Family, have less Occasion to resort to.

The Substance of those I call natural Improvements, may be comprised under the following Heads:

Commodious Buildings;

Laying Farms and Lands conveniently together;

Dividing large Grounds into lesser of proper Quantities;

Keeping up good Fences and Places for Shelter;

Supplying Grounds with Water to float them, where that can be conveniently done, and making proper watering Places where wanted;

Taking Water off, or draining Grounds which are too wet;

Proportioning Corn Land and Grass Ground properly for the Farm;

Making good Roads;

And lastly, I shall just mention the Alteration Time makes in the Value of most Lands; which may be of Use to several Gentlemen and others, to have it observed to them.

1. Of commodious Buildings;

We shall not, under this Head, launch out into the Manner, Method, or Expence of Buildings at large; which depend so much on different Situations, Prices of Materials, and Wages of Workmen in different Places; and which, if expedient, would fall more properly to be considered when the Farmer's House and Out-houses, &c. are treated of: but here I shall only observe, that large Timber is commonly one of the greatest

Expences of Building, and that great Roofs require the greatest Expence to support them: and in Farming Affairs a narrow and long Building will commonly answer the End full as well, or better than a short and wider one, and that at a much less Expence; except where they throw their Corn in order to clean it, which requires Space for that Purpose, the Expediency of which Method will be hereafter considered.

In other Cases, having Room to thrash in the Barn, and a Door toward the South West Wind, the Farmer will seldom want a Wind to clean his Corn; and when such a Case happens, a Hand Fan will easily supply the Want of it.

As to Standing for Beasts, thirteen Feet wide will do for four, whereas six require twenty Foot wide; and every Person of any Experience well knows, that a Roof of above twenty Foot wide, and the Expence of after keeping it in order, will far exceed that of thirteen Feet wide with the Addition of seven or eight Feet more in length for a third Row of Beasts; which Remark may be easily and usefully applied to many other Cases.

As to the monstrous great Barns formerly erected at such a vast Expence, as are to be met with in several Places, they are very little valued now; several judicious Farmers refusing to use them so much as they might: apprehending their Corn and Hay to be better and sweeter, when set in Stacks in the open Air, than when housed. And in many Places the tying up their Beasts, at any Time of the Year for the whole Night, is generally omitted, and they find them to do as well.

But what is of much greater Concern under this Head, is the Benefit which arises to the Owner of a Farm, both as to the Ease in the Management of it, and also as to the preserving it in a proper State of Husbandry. When the Buildings are prudently placed in the Ground, in Comparison of those placed at a Distance, or situated in low Places from which the Manure can scarce be possibly returned to the Land again, and what is so conveyed is at a great Expence; and consequently the upper or distant Land must be gradually impoverished.

Whereas, when the Buildings are on the Level with the Land, and in the Midst of it, the Manure cannot be lost, and the whole Course of Husbandry will be carried on with much more Ease, and at a much less Expence.

The Advantage of such a Procedure I saw made very plain, by removing an old House which stood in a Village distant from the Land, into a proper Place in the midst of the Farm; by which Means they always milked at the Door; and one Man, Woman, Horse, and Sledge, managed the same in general with as much Ease, as two Men, two Women, a Cart and Horses did before. And any one may easily compute how much was got or saved by it in the Year.

There are very few large Quantities of Ground; but some proportionable Advantages of the same Nature may be procured, with a little Discretion; at a very moderate Expence.

Lee Walls (as they are called) are frequently erected much in the Shape of a great L, both on Commons, and in large Pastures, by common



Tenants, to shelter Beasts and Sheep against severe Storms, and violent Winds from every Point of the Compass. The Benefit of them is very well known; and I have often wondered that something of this Kind is not more frequently to be met with in many Grounds near LONDON, and several of the Marshes in KENT and ESSEX, where there are so few Out-fences to shelter the Cattle from Wind and Weather.

A small useful Building which would very well answer this End, might be contrived at little Expence; and easily constructed so as to be taken in Pieces, and carried from one Place, and set up in another.

In an Affair I had in a bleak Marsh in ESSEX this Summer, with two Men in one Day I made a Shelter on a rising Ground for the Workmen, and so on, by sinking the Ground above a Foot, and making the Side Walls and back Part of the Turf and Soil, and then covering it with Boards, which answered every End proposed, and will do so till the Work is compleat, and the Wood carried away.

When the late Czar of MUSCOVY built PETERSBURG, he contrived the Houses so that one of them might, on Occasion, be taken down in two Hours, and easily set up again in another Place.

And when Sir WALTER RAWLEIGH went against the SPANIARDS, he carried all the Parts of the Vessels he was to use there, ready to be immediately joined together when they came to the Place appointed.

A Roof alone might be ordered so as frequently to be useful to set over a Quantity of new Hay in Summer, till a large Rick be made, or even to cover the Rick till it was finished in the Nature of a moveable DUTCH Barn; by which Method a good deal of Damage, and a great deal of Trouble, frequently occasioned by intervening Rains, might be, in a great Measure, entirely avoided; and there are few Farmers but suffer yearly by Rains one Way or other, before their Hay Ricks and Corn Stacks are so well covered as to be effectually secured.

Some use old Tarpawlines, which may be of some Service, and so would two or three Fleaks thatched, and hung cross a Rick, which any Farmer may very easily procure, or make for himself.

And why might not slight moveable Buildings, as above-mentioned, be of equal Use to our Horses and Cattle in Summer, by affording them a sure Shelter against the violent Heats, and other raging Inclemencies then predominant, as they do in Winter against Storms, Frosts, and excessive Colds.

Our Bodies, and those of our Beasts, are probably, in a great Variety of Instances, more like one another than many Persons are willing to allow.

Are we not subject to the same Sorts of Diseases, and are we not alike proportionably sensible of Heat and Cold, piercing Winds, and violent Storms.

The History of JAMAICA assures us, that there are Times, when, unless the Labourers put on their Cloaths, they will be in great Danger of losing their Lives; and in some Places with us, piercing Blasts have been almost as prejudicial,

and some Winds certainly subject us to particular Distempers, which are soon perceived, and occasion others, though we are not directly sensible of them at the Time of the receiving the Contagion.

Every Housewife is soon sensible of the ill Effects arising from the Cows being hurried about in hot Weather, both as to the Goodness and Quantity of their Milk. And I know a Farm in CHESHIRE which, on a moderate Computation, is thought to be damaged five Pounds a Year by the Cows being deprived, by a Navigation, from standing in a River in the Heat of the Day; and the Prejudice to the Pastures, by their gad-ing and running about, is very well known.

Any good Workman would easily contrive Buildings of this Nature, and we have some Plans of some such Sort of Buildings, which we shall communicate.

The next Head we have to consider is,

The laying Farms and Lands conveniently;

We have before mentioned two or three Instances of the great Advantages of laying Land commodiously together.

Every experienced Farmer will allow, that two Acres together, of the same conditioned Land, is of as good Value as five half Acres in distant Places in the same open Field; the Advantage is proportionably greater when the Portions of Land are less; and it is not uncommon to find many Parcels of Land both in open Fields, and good Meadows, containing much less; which when laid together and inclosed, are often more than double or treble the Value they were before; especially near great Towns, or in Countries where Grass Ground is scarce. And I believe, within my Memory, there have been fifteen hundred Acres of Field Land inclosed near DERBY, which from eight or nine Shillings an Acre, whilst in the open Field, is now let from three Pounds to twenty Shillings per Acre, and on an Average at about thirty Shillings.

This leads us to the dividing one Part of large Grounds from another, in proper Quantities.

This, as to the beneficial Part, depends pretty much on the same Reasoning as the last Articles; and to the Instances before given of the Benefit of it, I shall here add another of a formerly remarkable Piece of Land, called HADDON Pasture, near HADDON in DERBYSHIRE, the antient Seat, and Place of Residence, of the Duke of RUTLAND's Ancestors. Mr. LAWRENCE tells us of Mill Stones dug here: but he errs: this Author should not have been so severe upon others, unless himself had been more free from Faults. This was a large Piece of Lime-stone Ground, and usually joisted by taking in Beasts from all the Country over.

It has been lately divided into several Parts, by the Person who took it, with Lime-stone Walls, and set out again to under Tenants for two hundred Pounds per Annum more than the original Rent, or than was made of it whilst it was kept as a fine Pasture.

I could give several other Instances wherein I have been concerned, of the same proportionable Profit arising solely by the parting large Grounds with Lime-stone Walls, in Counties where that Material is to be had; which, though  
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not so slightly; may perhaps be found the most beneficial Fences in the whole Kingdom.

Where Lime-stone is to be had in the Ground, any thing near, the Stone will be got, led, and walled seven Quarters high, for about four Pence per Yard forward; and you immediately enjoy the Benefit of this Fence. The Foundation is but about two Feet broad, there are no Ditches on either Side, or any Loss of Ground near them; for the Scythe may cut, or the Plow and the Cattle have Shelter and Meat, close to its Side.

Again, here are no Roots to run into and rob the Corn, no Branches to drop on it, nor any Inconveniences of that Kind, which are usually objected to the dividing Corn Fields into less Pieces than sixteen or twenty Acres; and these Walls certainly nourish the Land seven or eight Yards near them, and receive the Nitre of the Air; for when an old one is pulled down it smells strongly of it. Many are very warm against any Plowing nearer the Hedges than seven or eight Yards; and a very judicious Farmer told me, that he never expects or finds above half a Crop near the Hedges, in proportion to what he reaps in the Middle of the Field.

This Remark therefore ought to be minded, in those Places where the Culture of Corn is principally designed. And I have observed that near St. ALBAN's, and toward HEMPSTEAD, the Corn Fields are generally pretty large, twenty Acres or more each.

Where new Hedges are to be raised, a good white Thorn is certainly the best; and if planted in proper Ground, may be made to save itself in four or five Years, and one dead Hedge, once repaired, will generally serve to guard it till it is safe.

I once planted a Hedge of this Kind with strong Sets out of the Woods, of above an Inch Diameter, set them eight Inches asunder, and cut them within eight or nine Inches of the Ground; and some of them (which I let grow to try what they would do) shot that Year six Foot high, and all soon made an Hedge for Cloths, when cut and kept in order, four Foot deep, and a Yard over; but these Sets were planted in good fresh Soil.

I had pretty much the same Success with some Thorn Bushes I removed for the same Purpose, cutting the Heads in Proportion to the Loss I apprehended the Roots had suffered by being transplanted, and they soon answered what I expected; and I believe the white Thorn, if indulged, would grow large; and be transplanted like other Trees. I have let some choice ones grow as large as Trees in Fences; and there are some single ones on the DERBYSHIRE Moors near MIDDLETON, by YOUNGCREAVE, which are as large as middling Ash Trees. These being about a Mile distant, are very good Guides to Travellers; and I presume were formerly planted there for that Purpose, there still lying about them many loose Stones, which I suppose were Walls round them.

This Method of raising white Thorn is not what is usually practised. But I cannot but think, from the Nature of this Shrub, that the Design of a Gentleman of my Acquaintance, was both reasonable and feasible.

He set in two Acres of Ground many Rows of white Thorns, which one out Fence secured. These, when grown up, supplied him with a successive Stock of Thorns; and when he had Occasion to take in any new Piece, he took Part of this to about a Yard high, and set them as a new Fence, the Thorns fenced the Outside, and the Ground being Corn, and nothing admitted into it after the Corn, at the End of the second Year it made a very good Fence. I saw not the Event of this, but another Gentleman assured me, he had practised it with great Success.

Such a Trial can be no great Hazard, the young Sets may be bought at about four Pence per Hundred, which, at nine Inches Distance, will go a great Way; and if they are to be rais'd from the Berry (which generally come not up till the second Year) there is a Method taken from an Experiment of Sir ISAAC NEWTON's published by Mr. BRADLEY, of bringing them to sprout in the first Spring, by placing them in Wheat Bran, kept warm, and sometimes wetted a little. And this I tried; and found they sprouted in Spring, but if too much wet be given them, it will be in danger of rotting them.

I have a great Dislike to black Thorns, on Account of their spreading (frequently seven or eight Yards) in the Ground, and neither they or Crabs must be admitted in a close Hedge, they both staining them very ill; as white Thorns will do just after cutting, but if a Shower intervene, or a few Day's Time, these do little Prejudice in that Kind. And Thorn is of so hardy a Nature, as to thrive where few Trees will, so it may be used as a good high Hedge, or as a Row of Trees, to shelter against cold bleak Winds; and I have seen such a Hedge grow amongst Elms, which, cut properly, seemed to be one entire close Fence, of forty Foot high.

As to dividing of Grass Ground into small Parcels, many are of Opinion, that one Close of ten Acres will maintain as many Cattle and as well as four Closes of three Acres each; the principal Reasons they give are, that in lesser Grounds Cattle quickly walk over them, and being sullied and stained with their Feet, they will not care to feed thereon; whereas, in larger Fields they have Room to range and feed, till the stained Places be refreshed with Rain or with the Dews, that there is a Loss of Ground by Hedges and Ditches, that 'tis easier to get Water in a great Piece than a little one, and that Cattle love a large Walk; and like not Grass under the Dropping of Trees.

To which it may be answered, that the dividing ten Acres into four Parts, allowing two Yards for the Hedge and Ditch, takes up but about one sixth Part of an Acre; that if there be Water it may be easily laid to two or three of the lesser Closes, or that may be eaten first which has the Water, and then laid to, that the other Hedges and Trees may be kept down, so as not to sour the Grass much; or if permitted to grow will be of above an equivalent for that Damage. And when they are eaten by Turns, the first will be wonderfully recovered and sweetened, before the Cattle are brought back to it; and it is not to be imagined what Conveniencies arise from four



four or five such small Clofes; at the best managed Farm I know, they have fix of them, they can go into or from the fold Yard, in which they can keep their Swine on Clover, and let them out each Night to their Supper; keep a Cow or two on good Grass, for good Milk and Butter, a Horse or two, to be ready on every Occasion, and eat the others as proper, whether they be Turnips, Clover, or Grass; or lead through them to farther distant larger Clofes, or keep a Piece of choice Grass, Clover, or Turnips, to top up fat Beasts with, or support them with at the Time other Pastures generally fail.

There has been so much said of Good Fences, and Places of Shelter, under the former Heads, that I shall only mention they are a Security of our Property to us, and the great Preservers of Peace and Quiet in a Neighbourhood. They preserve both our Grounds and our Cattle warm and well, and have such visible Good arising from them, that it becomes a Sort of a proverbial Saying, amongst the Farmers in one of our Counties celebrated for good Husbandry, That "A warm, close, high Hedge, is half the Cattle's Meat in Winter, in causing that which is given them to do them the more good," which is certainly as justly applicable to Shelters in Ground, as to Fences round Ground.

The next Article we come to is, the supplying Grounds with Water to float them, where that can be conveniently done, and making proper watering Places where wanted and suitable.

Where Lands are situated near Rivers or Brooks, or under rising Grounds above them; the Benefit of floating of Meadows in dry Seasons (and indeed at other Times) is frequently easily and very advantageously obtained; for Water is of that ductile Nature, that it may be easily guided from Place to Place, and near several great Towns there are many Meadows which must be mowed and cleared by Midsummer, lying common after, which owe their returning Fertility to the Wash of the Floods overflowing them after the Hay is got in; for which Purpose those Banks which were raised to secure the Grass, whilst growing, from Floods, are immediately after opened in several Places, to enrich the same Meadows by all the succeeding Floods, till the following Spring, when the Banks are again made up.

This is so fine a Way of improving, that wherever Water comes from off rich Lands, or is impregnated with the Wash of any Town, such a Floating is much to be desired; and it is a very good Practice to mix Manure with common Water, stirring it as it passes, as the Water will, this Way, convey it in the most beneficial Manner to the Grass Roots. But where none of these are to be had sometimes in great Droughts, the conveying common Water over the Meadows, will be very beneficial.

But what is more immediately under our present Consideration is, how to provide for that Want of Water, which is commonly the Case in Lime-stone, Chalk, Sand, and Gravelly Ground, which though they receive their equal Share of Rain and Dew from above, yet being porous and open, the Wet that falls soon sinks into the Ground, and so is lost.

Numb. XXX.

In some Grounds of this Nature there are Meers of Water, which supply the Cattle with what is necessary for them to drink; and where such are not to be met with, there are very few Quantities of Land where, in a low Place, the Rains may not be brought from the higher Ground, and a Basin, or watering Place, readily made, by laying a proper Mixture of Clay, tempered like Mortar, or by a Bed of Lime-asse well beat together; and I am assured, worked Chalk will answer the same End, laid at the Bottom and Sides of a Pit or Pool dug for that Purpose, which, if well made, will last long and answer the Purpose, especially at the End of Summer, and in Winter. But Care must be taken to cover the Bottom with some Sort of Pavement, to prevent the Cattle poaching Holes in it with their Feet; and the Reader need not be told there must be some Walls to keep the tempered Mortar safe on the Sides, as high as it is proposed the Pool should stand with it, and little Cuts, if necessary, to bring the Water from above, to the Place prepared for it.

The first of this Kind that ever I saw, was in a Gentleman's Lime-stone Park in SOMERSETSHIRE, which the Owner told me cost him at first thirty Pounds, and soon failed; but the Breach being found and repaired, it had then stood firm many Years, and was a very large one; but small ones are now made, where the Materials are near, for forty or fifty Shillings, and often so contrived as to fit two or three distinct Parcels of Land, by parting them in the Middle, or by loose moveable Rails, to lay them to one Side or the other.

The same Gentleman had walled his Park high enough to keep in his Deer, with Lime-stone Walls, but they being higher than dry Lime-stone, will commonly stand long. He poured in two Beds of Mortar whilst it was building, one at about two Foot high, the other about four, and the Wall then stood very firm.

Excess of Wet is often as prejudicial as the Want of it, which brings me to the Manner of taking Water off, or draining of Grounds which are too wet.

The principal Point, in this Case, is to find the lowest Place by which the Water can be carried off, and there open a wide Trench, of Depth sufficient to drain the whole, which may properly be kept open; into this side Cross Drains may be laid and covered.

The best Method for these Cross Drains is said to be that used in Essex, by making a Trench near two Foot deep, not above two or three Inches wide at Bottom, then filling it with Thorns, or any rubbish Wood, and covering it by turning the Turf downward, and then you may plow. The Difficulty is to lay the Drains in the lowest Places, in which the Essex Men are thought particularly skilled.

I have known, where Stones were in Plenty, little Sulls made at Bottom, and small Stones poured on it a Foot deep, so covered up, which answered very well; and I have also known wet Grounds much mended by very small Gutters, of four or five Inches wide, leading to proper Descents, and what came from them spread on the Ground, to prevent its being trod in again.

These



These are easily made, and easily kept open, and if deeper than the Roots of the Grass, will, on clayey Ground, carry off the Wet very well.

The proportioning of Corn Land and Grass Ground proper for the Farm, is an Article scarce possible to bring under any general Rules, especially since the new Husbandry has prevailed, by which the Farmer may keep more in Tillage, or Grass Ground of natural or artificial Grasses, as he pleases; and needs not want of either to employ such a Team as he thinks proper to keep, such Cows as he thinks proper to milk, such Cattle as he proposes to rear or feed; in most of which a judicious Farmer, if he has Ground enough, may make it answer any End he proposes, with proper Application of it.

One general Rule indeed there is, which he ought strictly to adhere to; which is, never to have more Ground in Tillage, or appropriated for Hay, than he can husband and dress well.

He had better have two good Acres of Corn than six of bad, or four of middling; and the Expence attending the worst, is as great as that of the best.

The same in Proportion may be said of Hay Ground; and in both Cases, if the worse Sort be pastured, or lie Fallow, it will be of some Benefit, and preparing itself for a future good Crop.

#### *Of making good Roads.*

The making Roads good meets with so general an Approbation, through the whole Kingdom, that there seems not to need any thing be said to encourage and influence Gentlemen, and others, to do it about their own Houses, and also to promote it in their own respective Neighbourhoods.

This might be generally compassed by the usual Labour of the Villagers, and a little Money expended under the Direction of a Person skilled in Affairs of this Nature; by which Method I have known Hills, before hardly passable by a single Horse, made almost as easy for a Coach as St. JAMES'S Street is; and the Side of a Precipice made a safe common Road, without Danger or Terror to the Traveller, by a Wall being erected next the Precipice, which takes off the Terror, and is a reasonable Security to the Passenger.

The Ease of Mind, the Safety to Man, Horses, and Carriages, the cheap conveying of all Sorts of Portables from Place to Place on good Roads, and the Time saved by it, will soon be an Equivalent for the Expence, and perhaps extend its Usefulness to unexpected Distances; so that it may be a Blessing to a Country, and even to future Generations.

The greatest Improvement of this Kind which I ever knew, was betwixt WYCH and WORCESTER; for when I first travelled that Road they were beginning to mend it, I saw eight or nine Horses hard set to draw a Tun of Salt; but travelling there again some few Years after, I saw no Waggon had above four Horses, and some but three, to draw the same Quantity.

The ROMANS, whose Wisdom we are so ready to commend in some Instances, where they less deserved it, in this Particular certainly demand our Applause and Imitation; for they caused

good Roads to be made from Place to Place, wherever their Legions came, and some of their Works of this Nature are still visible and useful amongst us, after all the Length of Time since passed.

To do Justice to CHESHIRE and LANCASHIRE, they have, I believe, laid out more Money in making good Roads, and to better Purpose, though Materials are very dear in many Places there, than any six Counties in ENGLAND, exclusive of Turnpikes; and most Farmers there have a Horse Pavement from their Doors to the great Roads; and some Gentlemen have expended an hundred Pounds, in paving from the Road to their own Doors, which in some Places would, if wisely managed, repair the Roads for some Miles.

It is scarce to be thought how far a good Pavement will carry on a Horse Causey in a Day, I speak within Compass when I name sixty Yards. And I had a Servant of my own, who with a Labourer to assist him, and Teams to lead to him, in a Lime-stone Country, made a new Road above eight Foot wide, and ninety long, in a Day, setting both Out-sides with the largest Stones for near two Feet on each Side, where the Wheels run, and filling and raising up all the Middle with what we call Lime-stone Gravel (being small Lime-stone) which if not trod on, in a few Days, will bind like a Rock, and on which the Horses will tread freely, which they never do where the Roads are set with great Stones.

The late ingenious Mr. COOPER, of LEICESTER, who gained so much Reputation by mending their Roads so well, brought all his Work to the following Certainties.

Twenty up-heaped Strikes (or Bushels) were a Load, which, when first measured and levelled as usual, Laths were nailed on the Carts for ascertaining it for the future.

Each Farmer filled his own Cart, and had generally one Penny half Farthing each hundred Yards it was carried.

The Gravel was got and spread at one Penny per Load, and a Person appointed to see all fairly done.

He farther observes, That Water Gravel never makes so fine a Road as what is dug out of the Earth, but where that is easier to be had, being mixed with a sandy Soil to bind it, it will make a good Road.

In some Places we meet with a softish Sort of Gravel, having too large a Mixture of Clay, Marle, or Sand amongst it, which, though laid thicker on the Road than ordinary, will not stand one Year's Wear; and yet we have found that some Gravel, after screening it, as it is done for Gardens, and leaving what falls through behind, to make as good and durable Roads as any we have.

These Particulars I have taken from a Manuscript of that Gentleman's never published.

The last Article I have to mention here is;

#### *The Alteration Time makes in the Value of most Lands.*

This Difference cannot be said to be an Improvement, but an Alteration of the Value of Lands, arising chiefly from the additional Quantity



tity of Gold and Silver constantly brought into these Parts of the World; so that, properly speaking, Gold and Silver may be said to be of less Value now than they were formerly, as an Ounce of either will not now purchase one half of the Quantity of the necessary Provisions for Life (exclusive of the Taxes laid on several of them) which they formerly did, and which it may be proper the Reader should be informed of.

The Rents reserved in Money, in College and other Leases, and the Rents paid in Corn, which in Queen ELIZABETH's Time were of equal Value, now are so different, that they are a full Proof of the Variation; for the half now paid in Corn, Malt, and so on, is at present above three Times as much in Value, as the other Moiety still paid in Money, as I have observed in the several Leases of that Kind which I have been concerned in.

A late Writer seems to think this to have been the single Case of one College, not knowing, I presume, that it was fixed so in general, by the great CECIL, in order to preserve a Subsistence for Bishops, Deans, Colleges, and so on; and if it had not been so ordered, most of those Bodies could not now have possibly subsisted on the Incomes of their Estates.

Hence we may infer, that Lands then let at twenty Shillings per Annum, should now, according to the Course of Things, be of the Value of near three Pounds, unless some extraordinary Circumstance varies any particular Case from the general Rule; as where the great Improvements made by Lime, and artificial Grasses on high Lands have sunk the yearly Value of those low Meadow Grounds, which, being enriched by the Over-flowing of the Rivers from the Lime-stone Mountains, pastured with Sheep, used to be the only Places where Spring Grasse, and early fat Meat were to be had: it being also within Memory, how better Families were obliged to lay in great Quantities of Hung Beef for the Winter, very little of that Sort of Meat being then killed in that Season, even in the great Towns; whereas, since the above-mentioned Improvements by Lime, &c. Hung Beef is scarce ever heard of, and fat Beef is now to be had in almost every Village, in every Month in the Year.

There are several other Particulars which might be considered under the Title of general Improvements, but as they may also be treated of under some particular Heads, we shall leave them to be considered as they may fall in properly hereafter.

In the preceding Part of this Work the Reader has been led through all the various Soils usually to be met with in these Kingdoms, and the different Methods commonly taken to improve them by Dungs of all Sorts, as well as by the artificial Manures of Lime, Salt, and the rest: all which have been copiously treated of, and (after some other intervening Articles) the Method and Manner of Plowing, Sowing, Harrowing, and Rolling, have been sufficiently enlarged on; the several Grains, Grasses, and Roots themselves come now to be particularly considered.

But before we enter into the distinct Consideration of the several Sorts of Grains, Grasses, and

Roots, usually sowed and propagated in this Kingdom; we apprehend it will be proper to take a short View both of the Antient and Modern Tillage, which have prevailed amongst us; which, when stated in a plain and intelligible Manner, the Reader will be thereby the better instructed, how to form a proper Judgment of their several Advantages and Disadvantages, and know how to guide his own Practice, and to fix to himself a sure Rule for his Conduct.

#### *Of the old Husbandry.*

The usual Method of Tillage in the Corn Counties in ENGLAND formerly was, and still is, in those Places where what is called the New Husbandry has not yet prevailed, conducted in the following Manner.

Each several Village in the Corn Counties generally had three distinct common Fields (or Sides, as frequently called) belonging to it, usually of pretty near equal Quantities; which three Fields were appropriated to three several yearly Courses of Tillage.

One of these three, each Year, is appropriated chiefly to Wheat, though sometimes it had Barley in it, and this has always born the Name of the Wheat Field.

The second is called the Pease Field, being sowed, for the most Part, with that Pulse, though Beans and Oats, as found convenient, are commonly sowed therein also.

The third Field, or Side, is called the Fallow Field, as not being sowed at all; but repeatedly plowed, harrowed, and manured, as the Owner judges best for his Land, in order to prepare it for the following Crop of Wheat or Barley, in the succeeding Year.

These three several Names are regularly successively applied to the said several Fields, according to the Course they come in, of being sowed with Wheat or Pease, &c. or lying Fallow.

These were the repeated successive Rounds of the ENGLISH Tillage, in former Ages; and they were found sufficient to produce good Corn, and that in great Quantities; and the same Method is still continued in those Parts of the Kingdom, where what is called the New Husbandry, has not yet prevailed.

The manuring, and two Year's due plowing, the two fallow Years (with proper plowing and sowing the other four Years) were found sufficient to produce four successive reasonable good Crops in the six Years; and those four such Crops again produced a sufficient Quantity of Manure, for the dunging the Ground during the said Circle of six Years.

But when Lime was found to be very beneficial for the producing of good Corn, and has been applied accordingly for that Purpose; where that could conveniently be had, it hath made the well manuring the common Corn Fields much better and easier, and rendered the less Dung necessary for the said four Crops in the six Years.

And though Corn was also formerly sometime sowed in inclosed Grounds, and much more so since the late Improvements made by Clover and Turnips; yet the open Fields always had, and still have the Preference, as producing the best and sweetest Corn, and as the least subject



to Smuts and Blights; and it is also found, by common Experience, that Corn growing near an Hedge has not usually so great a Quantity as that which grows in the Middle of the Close; the Reason for, or Cause of which will be mentioned hereafter. The open Fields have also more of the Sun and Air, are less annoyed by Birds, and have less Fences to be taken Care of, those being usually made by the Lands adjoining to them.

There are some Inconveniencies the open Fields were always subject to, by their being generally divided into small Parts, and those the Property of different Persons; for by Reason of this the Farmer is obliged to plow always the same Way, and never can plow the cross Way, which is often found very useful for the Ground; and there are some other Inconveniencies which the Owners of Field Lands are subject to, in order to preserve the general Peace and Quiet of the Neighbourhood, such as observing pretty much the same Times, and Seasons of plowing, sowing, reaping, and fencing.

The dividing the common Corn Fields into so many very small distinct Parcels, as they formerly were, and in several Places still continue to be, to a surprising Degree, is worthy a distinct Consideration. A Farm of mine, under thirty Pounds per Annum, containing one hundred and fifty-three Pieces, forty of which were not each a Rood, and two Acres no where lying together, and the whole Township being also much in the same Manner, very few of the larger Estates having two Acres together in many Places.

This Method of dividing the Fields into so many small Parcels, is generally thought to be owing to a political Design of our Ancestors, to promote the Culture of Corn, by preventing the Fields being inclosed, as they were made the distinct Property of so many different Persons.

But I presume this Method of dividing the Ground was rather owing to the parting it amongst the Followers and Soldiers of those who succeeded in conquering, as a Recompence for their Services, according to some of the antient Military Ways of proceeding.

This seems most agreeable to the old Method of the SAXONS, as evidently appears by the customary Mineral Laws in DERNYSHIRE; by which, though the whole Mineral Field is at liberty for any Person to work in, yet if any one finds a Mine there, by that customary Law, he can take but so many Yards as the first Proprietor; and every other Subject, and he himself may take other Quantities of two and twenty Yards, one after another, till the whole be possessed or taken; but then, every distinct said Number of Yards so taken, is a distinct Title and Possession, and may be separately owned by many different Persons in Partnership. This and many other Customs, prove that the Law used there is the best Remain we now have of the SAXON Method of proceeding, which was short and clear, as the learned Doctor HICKES, and others, well skilled in our Antiquities, generally have shewn.

The Method before mentioned was, in general, the Course of the ENGLISH Tillage, till the Introduction of the foreign artificial Grasses, gra-

dually within about eighty Years last past; and the Advantages by the sowing those Grasses and Turnips, in the Inclosures, and also now in many of the open Fields, and particularly by that of Clover.

For by Clover and Turnips many of those Lands which formerly were of very little Value bearing little Grass, and no Corn, have been rendered very profitable as Grass Ground; and also brought to produce very good Corn of most Sorts; and those Lands both in the open Fields, and in the Inclosures which formerly were thought to answer well to the Plow in the Course of Tillage, have been greatly improved even in that Respect, by the sowing of Clover and Turnips; and that third Year, which was before constantly in a great Measure, lost by lying Fallow, is now generally made to produce a Crop of Clover or Turnips commonly worth, if tolerably well managed, at least twenty or thirty Shillings an Acre, often more; which Clover and Turnips are so far from occasioning any additional Expence, that they are found much the cheapest and best Methods of preparing the Land for Corn.

These two, with the other artificial Grasses, have given a quite different Turn to the general Course of our Husbandry; and where the sowing of Clover and other artificial Grasses, and of Turnips and other Roots have prevailed, the Method of managing with and by them, has obtained the Name of the new Husbandry; to which we may not improperly add the Method of Drill Husbandry, which, though not so modern as some pretend, being introduced here by the late Earl of SANDWICH, as appears by the Philosophical Transactions \*, the Inventor of it being Don JOSEPH de LUCATELLO, Knight, who had the same publicly tried in GERMANY and SPAIN, and had a Patent granted him by the King of SPAIN, about the Year one thousand six hundred and sixty-five, as the Inventor of the Drill Plow, called then the Sembrador, contrived to Plow, Sow, and Harrow at once.

But the same Method of Husbandry being practised by the late Mr. TULL, who wrote a Book on this Subject, that Method has prevailed in several Places, and consequently may be properly considered under the Head, and as a principal Part of the new Husbandry; to which we shall now proceed.

#### *Of the new Husbandry.*

The Advantages of this new Method of Husbandry, when set in a proper Light, and compared with the former customary Tillage, are really so many and so great, as justly to entitle it to the Preference; and consequently it very well deserves the attentive Consideration of every Person any way particularly interested in Affairs of this Nature, and who is not directly, or in Consequence interested in Husbandry on which our Sustenance depends?

In our Entrance on the Consideration of which, as we before stated the Course of the former Method of Husbandry, in a clear Manner, to the Reader's View; so we will endeavour to do the same by this, as short, clear, and fully as we can; but this modern Method, admitting many more Variations, both as to the different Sorts, and

\* Phil.  
Trans. 2  
Vol. 74  
744.



and the greater Number of Seeds to be sowed, and also more yearly Changes of the Corn, than the other does admit of; consequently the Course of this new Husbandry cannot be comprised in so few, easy, and familiar Rules as the other was.

Indeed, in this there cannot be many certain Rules of successively sowing of Grain laid down, to be constantly followed, for a regular Succession of Years; for in this new Husbandry there being many more Grains, Seeds, and Roots to have their Turns in the Course of Tillage, they consequently give the Farmer a much greater Latitude of varying and altering his Crops, so that he is not under that Necessity of repeating the same Species of Corn in the same short Number of Years he formerly was.

By this new Method of Management it is proposed, that the Farmer shall generally have six successive profitable Crops, for six Years together, from the same Parcel of Ground, without the Loss of any one Year, by letting it lye Fallow: at least he may reasonably expect eleven good Crops in twelve Years; and all these eleven or twelve Crops successively, Year after Year, to be of as valuable Sorts of Grain, and as good in their respective several Kinds, and got too with as little Trouble, and at as little an Expence as the four Crops obtained in six Years, or as the eight in twelve Years usually are in the open Fields.

In order to manifest the Truth of this, it will be necessary to state the Course of this new Husbandry in two or three different Methods, to make it the more plain.

Now by one Method Wheat may be ordered to have its Turn, or to be the Crop once in four Years. Thus,

First, Wheat.

Second, Beans, Pease, or Oats.

Third, Clover.

Then Wheat again.

Or Beans, Pease, or Oats, may be varied, and the Clover omitted, as the Farmer pleases.

By another, and in Appearance a preferable Method, the Wheat, Barley, or other Grain will succeed one another but once in six or seven Years; and may be ordered after the following Manner,

Wheat the first Year.

The Second, Beans, Pease, or Oats.

Third, any other of the last three.

Fourth, Turnips.

Fifth, Barley.

Sixth, Clover, and then a Return to Wheat, or any other of the Crops, for which the Ground will be well prepared again; or if it be liked better, the Clover may be continued two Years together, and will answer very well.

Reckoning the Clover as proper to be sowed two Years in the six, by this Method here is a Provision for eight Years Crops, out of which the Farmer may chuse any six of them he thinks the most suitable to his Soil and Circumstances.

By such a Method as this he reaps three of the richest Crops, and one of Beans or Pease, one of Turnips, and one or two of Clover, in six Years succeeding each other;

N<sup>o</sup> 30.

whereas there can be but four obtained in the same Time, by the common Course of Tillage, and consequently the new Method of Husbandry has the Advantage of two more Crops in six Years, than the old Method of Culture; which, on Presumption that the Crops are equally good in the Kind, is greatly to the Advantage of the modern Husbandry.

All these several Grains and Seeds may still be farther varied, many other Ways, as will hereafter appear, the better to prevent the too quick a Return of sowing the same Grain again on the same Ground, which when done is generally attended with a very poor Crop, not only in every Grain sowed in the Field, but also in every Herb and Root sowed or propagated in the Garden, as is constantly experienced. Therefore every judicious Farmer, and every prudent Gardener, will carefully and constantly avoid such a Practice, and will frequently change their Grain, their Herbs, and their Roots, from one Spot of Ground to another; till Time, or some Course of Husbandry, hath prepared the Ground again sufficiently for the producing another good Crop of the same former Grain, Herb, or Root. Nothing but Horsehoeing can set aside this Necessity.

The Change of the Ground otherwise, as well as of the Seed to be sowed, is of that Importance in the Course of Husbandry, that we cannot press the Farmer too earnestly to attend carefully to it in the general Course of his Tillage; though I know a very good Husbandman has had a good Crop of Wheat, next one of Beans, then one of Pease, and then ventured to have Wheat again, and succeeded very well in it; but then his Ground was in very good Heart, and he knew Beans and Pease were generally good Grain to go before Wheat, and he himself thought it was full soon enough to sow Wheat again with a reasonable Expectation of very good Success, without too much impoverishing the Land for a future Crop of Wheat.

A very little Consideration will guide the Farmer in varying the several above-named Grains, Grasses, and Roots, so as (with God's Blessing, and tolerable Husbandry) to be reasonably assured of obtaining good successive Crops; or the continuing Clover two Years together will answer very well, as to the profitable Part: and on Course it will lengthen the Time one Year before the Return of another Crop of Wheat, and also of every other Sort of Grain, Grass, or Root, by which Means the Ground will be the better replenished with Nourishment for the first Crop again.

To the great Variety of different succeeding Crops, which may be contrived only from the several Species of Grain and Grasses above-mentioned, the Farmer may easily add many other new Changes, by the sowing of Rye, French Wheat, Lentils, Coleseed, and so on; as may best suit his Land and Circumstances, with which he may make such various Changes, as to carry on a Course of profitable Tillage of the same Ground, to a much greater Length of Time than can be easily imagined, especially after it has shared the Benefit of being marled, limed, or chalked. Four Bells will change or vary their Places so as never to come again in the same Order, four and



twenty Times; and five one hundred and twenty Times, and here are many more than five Sorts of Grains, Grasses, and Roots, which may be brought into the Succession of returning Crops, after the Manner mentioned of Bells, though not to so great a Degree.

But wise Farmers will not carry this to those great Lengths; it might possibly be done with Profit if they could keep the Land clean; but will rather chuse to lay down Part of the Ground they have in Tillage, with profitable lasting artificial Grasses, or good natural ones; and break up some fresh Ground for Corn (for it cannot be imagined that any Farmer has all his Ground in Tillage at one Time) and by these Methods he may vary his Crops as he pleases, and give his several Grounds what Years of Rest he thinks proper, before he brings them on again to a new Succession of Grains, in a new Round of Tillage.

The Passion for the Plow is certainly very great in general, and for Wheat in particular, as it is the best, and commonly the most profitable Grain, but I believe, before this System be completed, the Reader will be convinced that other Crops will often be found more beneficial, than to bring Wheat on again in two quick a Succession, without allowing the Ground Time to gain proper Nourishment for it, tilling it properly, or manuring it with such Dressings as to enable it to bring a good Crop again soon; without one or other of which Wheat is frequently found to bring in little Profit, and in some Cases not to pay the necessary Expenses and Rent.

To convince the Reader of the Truth of what we have said, as to the Profit of the soon Return of, or respiting the Wheat Crop only for one Year, I will calculate the respective Profit which may be reasonably expected from Wheat Crops in twenty Years, when each fourth Year, and when sowed each fifth Year during that Period of Time, in which the longer the intervening Time is between, the better the Crop will pay.

Now in this Case, in the first Method there will be five returning Crops of Wheat in the twenty Years, and three Years between each Crop to manure or improve it; and it cannot be reasonably supposed to produce above twenty Quarters of Wheat, that is, four Quarters each Wheat Year.

In the other Method there will be but four Crops of Wheat in the twenty Years, which, with the same Method of Husbandry, and one fourth more of Time must, by the Rule of Proportion, be the better prepared by one fourth Part for the producing of so much a better Crop; which then must be five Quarters each four Wheat Years, which will amount to just the same Quantity of twenty Quarters in the said twenty Years.

This Method of reckoning is not only agreeable to Reason, but on stating it in this Manner to some very judicious Farmers, they have judged it to be according to what they experience in their Course of Husbandry; and that the Crops in general commonly are better or worse, according to the Time allowed betwixt the fresh sowing again of the same Sort of Grain.

I am not aware that I am guilty of any Mistake in this Calculation, unless I may be thought to estimate both Crops too high, and if any Abatement of that Kind be necessary to the one, it is equally so to the other, and the Account will come to the same at the last, or rather, turn more to the Advantage of the four Crops; for five times three and an half would be seventeen and an half, and four times four and an half would be eighteen Quarters, and much the same will be produced if different yearly Produces are taken.

Now supposing the Profits equal in the Case of the four Years of Wheat in the twenty, there will be the Seed and Husbandry of one Year entirely saved; and as it is probable that Clover might be continued the Year Wheat was omitted, or a Crop of Turnips got; such a Crop, and such a saving may moderately be estimated at two Pounds ten Shillings gained or saved in this Case, which may be equally applied to many other Cases of the same Nature, which will ease him of such Calculations which many are unacquainted with.

From what has been said the Reader cannot but observe, that the Substance of all the modern Improvements, especially as far as they relate to Corn and Cattle, are principally owing to Clover and Turnips, each of them producing great Quantities of Sustenance for our Cattle, and at the same Time preparing the Land so well for Corn; that where they are properly used there is very little Occasion for the Loss of letting the Land lye Fallow in general, but only on some very extraordinary Occasions.

Those two therefore must consequently deserve to be treated of, in a full and copious Manner.

And since Wheat is the principal Grain to be wished for, and generally the most profitable when obtained, and Clover and Turnips, either directly or in their Consequences, the best Preparatives for it; we shall consider Wheat, Clover, and Turnips as the three chief and most excellent of Grains, Grasses, and Roots, and endeavour to do Justice respectively to their many useful Qualities. In this Method we shall not only take in the principal Part of all what concerns the old Manner of Tillage, but also all the material Alterations and Improvements made by what is called the new Husbandry, adding thereto some brief Observations on the Method of sowing less Corn, and at a greater Distance than commonly practised; and I shall also take some little Notice of several Compositions and Manures, which have been lately found beneficial both to Corn, Roots, and Grass Ground; and shall occasionally touch on the Method of drilling the Ground.

We shall here observe some of those Consequences which the Prevalency of the new Husbandry must necessarily produce, when it is considered on the disadvantageous Side; where it may be thought to occasion some Inconveniences or Hardships to others, leaving it to every Reader's own Thoughts, to judge of the good or bad Consequences of it to the Community in general.

The new Husbandry prevails principally in the South Parts of the Kingdom, and travels but very slowly Northwards, and consequently must, at pre-



present, very much affect the North Country Farmers, and their Landlords in Course soon after; for if, by this new Method of Husbandry, the South Country Farmer can really produce, by the same Ground and Husbandry, but one fourth more profitable Grain, Grass, and Root, in the Circle of six Years, than the North Country Farmer does, the South Countryman will be able to undersell the Northern, and consequently the Northern Men must sink, or their Farms fall in their Value, which must at last fall on the several Landlords.

The same Remark may be also made in Relation to the Vale Grounds, and the Uplands; for since such great Quantities of good Hay have been obtained in the Uplands, by the Assistance of the foreign artificial Grasses, this must in Course sink the Value of the formerly so highly valued Hay got in the Vales.

The same Observation may be made relating to the rich Dove-Bank Lands, and some others in the Kingdom of the same Nature, which were formerly so famous and so valuable for their feeding of Cattle so early and so well, that they bore an excessive Price; but since the many very great Improvements made with and by Lime, by which many other Places are brought to feed all Sorts of Cattle very well, those high-prized Dove Lands have several of them sunk very considerably in their yearly Value.

But if the Northern Farmers should go into the several new Improvements, as both their Lands, and their Labourers and Expence of living, are much cheaper than those in the South; by such a Method of Management they might be on an Equality with, or have the Advantage of the South Country Farmers. For as for their being nearer or farther from the best Markets, those Circumstances were always the same, and seem in general unalterable, though some Variations may probably be hereafter made therein, by making more Rivers navigable, or future better Contrivances of Carriages, or mending of Roads, by some of which I have known four Parts in five of Carriage saved:

Though the several Species of Corn, Grasses, and Roots, will be separately considered under their respective Titles; yet we thought the stating them together in the several Views above-mentioned, would guide the Reader the better and easier how to vary his several Crops to his greatest Advantage, than if he was left to make such Collections himself, which would cost him more Pains and Thought than he will be apt to imagine; notwithstanding which there is still Room for any sensible judicious Reader, to make many other useful Variations of his Crops, than he will at first imagine, or than can be easily described.

We come now to consider the several Sorts of Grain, Grasses, and Roots separately, and shall begin with the principal and most valuable Grain, which is Wheat.

Wheat is of so excellent a Nature, and of so general a Use, that it cannot be too much commended, nor sufficiently taken Care of as to the Culture and Management of it; for which Reason we shall treat of it first in general, as it really is what it is frequently called, The King

of Grains; and we shall after consider the several Sorts of it in particular, and the Culture, Management, and Produce of it; by which the Reader will be instructed in the Nature of it, as it is a very curious Grain, and also in what relates to it in particular, as it undoubtedly is the most useful of all Grains in these Parts of the World; if not of all Grains in the whole World; to which Title it seems to have a Right to put in a very fair and just Claim.

#### *Of Wheat in general.*

There are three Things which chiefly make any Thing much esteemed by, and truly valuable amongst Men:

First, The real Use and Benefit of it.

Secondly, The Ease with which it is to be acquired: And,

Lastly, The intrinsic Excellency of its own Nature.

All which good Qualities, or Properties, Wheat is possessed of in a very eminent Degree.

As to the real Use of Wheat we apprehend is that which not only in general supports the very Life of the greatest Part of Mankind, but also supplies us with numerous other Conveniencies to make our Lives easy, comfortable and happy; affording us Strength, Health and Pleasure; being the best Nourishment, and our chief Support as to what is eatable; and also affording us excellent Malt for Drink, whenever it is thought proper to use it for that Purpose. It grows in almost all Countries, and in such a Variety of Soils, that very few Places need to want it: and to use the learned Dr. DERHAM's Words, speaking of the Blessings we enjoy, he says, "Among Grains  
" I might name the great Fertility of such as  
" serve for Bread, the easy Culture and Propagation thereof, and the Agreement of every  
" Soil and Climate to them."

As to the second Article, The Ease with which it is to be acquired.

Two Things may properly fall under our Consideration:

First, The usual Labour and Expence necessary for the obtaining a Crop of Wheat. And,

Secondly, The Quantity it generally produces.

As to the Expence and Labour necessary to procure it, they are so well known in general, that they will not deter the Farmer from endeavouring to obtain it; they being generally so full of the Expectation of the Profit of it, as to want no Encouragement to attempt the cultivating it: thus generally depending on the Profit of a Crop of Wheat to pay two Years Rent, and the Husbandry necessary for the three Years in the old Course of Tillage. The Particulars necessary to be known in this Respect, will fall under Consideration when we come to treat of the Ways and Means preparative to it. However, on a general Estimate, supposing two Years Rent and Accidents one Pound five; Plowings, Sowing and Reaping one Pound five; Seed and Weeding fifteen Shillings; Manuring it one Pound fifteen. This whole Expence would amount to five Pounds; and reckoning the Farmer to have but four Quarters and a half,



half, and that to be sold at thirty Shillings, he is paid for all his Labour, and has one Pound fifteen Shillings clear Profit; for the Straw is sufficient to pay for the Threshing.

*Of the Quantity of the Produce of Wheat.*

If we consider what great Quantities of Wheat have been produced both formerly and of late Years, in some extraordinary Instances; and also what may reasonably be expected commonly from it, in a Course of good Husbandry, on Ground proper for it; what has been before mentioned will appear a very moderate Computation of the Profits arising from an Acre of this Corn.

The Instances mention'd by *PLINY* of the Fertility of Wheat, are yet too remarkable to be omitted; "Nothing, says he, is more fruitful than Wheat (which is the chief Support of Mankind) from one Bushel one Hundred and Fifty are produced; and the Procurator sent to *AUGUSTUS* (which is scarce to be credited) one Grain which had about Four Hundred Stems; and another was sent to *NERO* which had Three Hundred and Fifty."

To which I shall take the Liberty to add a Paragraph relating to the Use of Wheat, from the ingenious *Dr. DERHAM*, in the following Words:

"Among the many Contrivances for Food, I cannot but attribute that universal Aliment, Bread, to the Revelation; or, at least, the Inspiration of the Creator, and Conservator of Mankind; not only because it is a Food used in all or most Parts of the World; especially because it is of incomparable Use in the great Work of Digestion, greatly assisting the Ferment, or whatever causes the Digestion of the Stomach." Of which take this Example from the noble *Mr. BOYLE*, "The extracted Menstruum from Bread alone, that would work on Bodies more compact than many hard Minerals; nay, even on Glass itself, and do many Things that Aqua Fortis could not do: yet by no means was this so corrosive a Liquor as Aqua Fortis, or as the other Acid Menstruums." The Way of preparing this is deliver'd in *HARRIS's* Lexicon.

We need not go so far backward for Instances of extraordinary Fertility of Wheat, since in our own Country, *Mr. Evans*, of *SOUTHAMPTON*, had from one Corn eighty Ears, containing about Four Thousand Grains; some had sixty, and some had seventy Grains; and he had on the whole about six and twenty Quarters on an Acre, when the Corn was set at ten Inches Distance.

*Mr. HAMILTON* mentions, that on trying *Mr. MORTIMER's* Receipt for steeping Wheat in Water, Pigeon's Dung, Nitre, &c. though but little of it appeared above Ground, what came up branched so, that he could number forty Stalks from one Grain; every Head was very long, and the Grain large; "I planted it, says he, about ten Inches distant, I don't doubt if I had given half the Seed, that I should have had a very large Crop."

There have been several Instances much of

the same Nature, but not to insist on these extraordinary Cases; we are well assured of there being eight or ten Quarters or more on an Acre in *CHESHIRE*, and in other Places, on Lands well husbanded and carefully managed. And *MILLER* mentions eight or ten Stalks from one Corn, and eight, ten, or twelve Quarters of Wheat on an Acre as no uncommon Thing, both in his own Case and in that of others, which he has seen and observed.

This last Summer I have taken up Wheat both in *HERTFORDSHIRE* and *ESSEX*, with eight Stalks and under from one Corn; some of which had thirty odd Corns in an Ear, and some above forty, which some of the Owners had never observed, but then counted, and only before thought the Corn heavy: fifty to a Stalk comes to *Mr. EVANS's* Calculation of four Thousand for one; and at eight Stalks, forty five in an Ear, will be three Hundred and sixty from one.

The several Calculations after mentioned, from the Grain when set at different Distances, will probably give the Reader a clearer Notion of what Produce may be reasonably expected from an Acre of Land as differently sown or set, than any Instances of what others have obtained will do; and therefore we shall only here add the Case of *Mr. YELVERTON* in *IRELAND*, who had the Reward allowed for the Person who should produce the most and best Wheat on an Acre of Ground in that Kingdom; by which the Reader may see what may be gained by a proper Management of Land, in the Method that Gentleman took in the Ordering of it.

*Mr. YELVERTON* in 1742, had the Prize in *IRELAND*, having six Hundred sixty-eight Stone and eleven Pound of Wheat off of one Acre.

The Method he took was to change his Seed; then he sowed it not too thick; and he mowed it.

The Seed was steeped the Evening before the sowing it in a Pickle, and he riddled hot dry Lime over it as usual.

The Pickle was thus made;

Take Rock Lime and Bay Salt, put them together in a large Vessel: then throw in a sufficient Quantity of Urine, still stirring them till it dissolve the Salt, and slake the Lime; let them continue so twenty-four Hours, and then let the Liquor run out into another Vessel for Use.

The Corn should remain from Night to Morning in this Pickle before sowing.

This Liquor prevents the Smut, and destroys a pernicious Insect, which he calls the small red Worm, often destructive to Seed, especially in rich old Grounds.

I presume, that in this Case the Lime and Bay Salt qualify the usual Effects of the Urine, which, when used alone, is subject, as many have observed, to prevent the Wheat from growing. This I have also experienced myself in some Trials of that Kind, though at the same Time I have found the Seed grow when the Urine has been mixed with half Water.

After giving the Reader this general View of Wheat, and some particular Accounts of its Produce; we shall now proceed to consider this noble



noble Grain in a more particular Manner, by tracing it from its Origin in the Seed, through the several Stages by which it passes to its full Maturity; and in this Course we shall endeavour to comprize whatever is necessary or worthy to be known relating to it; the whole of which we shall comprize under the following Heads:

In the first, We shall consider the Nature and Contexture of it; with the Manner of its Growth.

Second, What Ground is proper for it.

Third, How the Ground is to be prepared to be most agreeable to it.

Fourth, How the Wheat is to be prepared for the Ground.

Fifth, How they are to be ordered whilst they continue together.

And lastly, How the Wheat is to be managed when separated from the Ground.

But before we enter into the Account of its Nature and Growth, it will be proper to give a Description of it, and to mention the several Sorts of it, and which of them are the most commonly propagated.

Wheat is an Annual Plant, tall and slender in the Stalk, with grassy Leaves and a heavy Ear; the Root is fibrous, and the Stalk hollow. The Construction of the Ear is this. Each Husk is composed of two Leaves, or Valves, which are of an oval Form, and generally contain three Flowers. Each Flower is composed also of two Valves; the outward one belly'd, the inner flat. In this stand three Filaments, with little dusty Knobs split at their Ends. In the Centre of these is placed the Rudiment of the Grain. From this rise two Filaments, which are feather'd at the Top; these catch the Male Dust that afterwards impregnates the Seed. The Seed ripens by Degrees after this, and the two Valves of the Flowers retain it till it is separated by Time or Force.

The several Sorts of Wheat are;

First, White or red Wheat, without Awns.

Second, Red Wheat, in some Places called KENTISH Wheat.

Third, White Wheat.

Fourth, Red ear'd bearded Wheat.

Fifth, Cone Wheat.

Sixth, Grey Wheat, in some Places called duck-bill Wheat, and grey Pollard.

Seventh, Polonian Wheat.

Eighth, Many ear'd Wheat.

Ninth, Summer Wheat.

Tenth, The Wheat called naked Barley.

Eleventh, Six rowed Wheat.

Twelfth, Long ear'd Wheat.

Thirteenth, White ear'd Wheat.

These are strictly seminal Variations, not distinct Species; nor are several of them of any great Moment in general; but we thought it proper to mention them all in a Work of this Nature.

The first six Sorts commonly grow in ENGLAND; but the first, the fourth and the fifth, are the best worth cultivating here; as being very hardy, and affording a greater Quantity of Flour than the rest. The Cone Wheat is to be preferred to all, as having a larger Ear and fuller

N<sup>o</sup> 30.

Grain than any other, and is the Kind most sowed near LONDON.

Some prefer the third on Account of the extreme Whiteness of its Ears, and some the bearded, as thinking it less subject to mildew; but of this there is no Certainty.

The Polonian Wheat is little cultivated now to what it was formerly; nor is there any Reason known why it is omitted.

The eighth is little cultivated here, though much in ITALY and SICILY; some Stalks of it have seven Ears, and it has commonly three or four; which often occasions its being laid.

The Summer Wheat is sown in the Spring, and is ripe as soon as the other; but not producing so great a Quantity of Flour as some of the others, it has been neglected, tho' it may be very proper when the other miscarries.

The tenth Sort is little cultivated, the Grain being thin, and the Flour coarse; but it is very hardy, and will grow upon any Soil.

The six rowed Wheat is not very common, the Ears are but short, and have each six Rows of Grains in them.

The twelfth Sort is cultivated in several Parts of ENGLAND, and much in WALES; the Grain is pretty long, but not so full as some other Sorts, it has a greater Quantity of Chaff, and the Awns of it are as long as those of Rye.

To these we shall add the following Varieties of the others:

1. Egg-shell Wheat; this is reckoned best for light Lands, and to be mixed with Rye for Malt, it being early ripe.

2. The Double-eared Wheat; this prospers best in a heavy Clay, or a loamy Soil.

3. The Red or KENTISH Wheat; this is much sown in HERTFORDSHIRE.

4. The Great-bearded Wheat, which thrives well on a heavy Clay.

5. The white Pollard Wheat.

6. The Flaxen or Lammas Wheat.

Egg-shell Wheat is reckoned the best of all others for yielding the whitest Flour, and making the best of Bread; it will grow well in a loamy Earth, and in gravelly, chalky, and sandy Loams; it suits light Lands best, and is generally early ripe.

As to Red Lammas; as Wheat is the King of Grains, so this has been esteemed hitherto the King of Wheats. It grows best in the richest Vale Lands, or blue Clays, where I have seen it near five Foot high, yet it is sown by many in Up-Land dry Loams, and even in some Gravels, that have been before dressed extraordinary well: and this is that noble Sort whose Kernels are somewhat longer than Perky Wheat, and near as big as Cherry-stones. When sown in a right Soil, will out-weigh Perky, but turns not out so much Flour; it is six Inches taller, and so subject to fall.

Yellow Lammas has a white Straw, and a red Ear; the Flour is near as white as that of the other Lammas; it will grow on Chalks, Gravels and Clays, and other poorer Lands better than Lammas.

Perky has a white Straw, a white Ear, and a red or yellowish Kernel, more round than Lammas. It comes into Repute as it will do well in

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chiltern



chiltern Grounds, chalky and gravelly Soils, well dressed; it will do in poorer Ground, and turn out as much, and is not so subject to blight. The Vale Farmers now find that it yields more than Lammas, is hardier, and will grow in a coarser Tilth, in a proper Soil, and will do with less dressing than Lammas. It bears late sowing best, and is to be sown after artificial Grasses, Pease, Beans and Turnips with one Plowing.

White Wheat has a white Straw, and a white thick Ear; its Kernel is as big as Perks. It grows closer together than red Lammas, and so is better secured from Blights. It has two or three Chaffs, which secure it against Flies. It thrives well in inclosed, poor, gravelly, chalky and light loamy Soils; and is much sown and mixed with red or yellow Lammas: it weighs lighter, but makes more Flour than the Perks or Lammas. Bakers mix them. It will grow well both in vale, swampy and stiff Soils, and in chiltern dry Grounds.

Duck-bill or Dugdale Wheat has several Names, and has a darkish brown guttery Kernel, rather bigger than other Wheat, the Chaff, by its Sharpness, hurts the Horses Mouths. It is sown in Vale and Chiltern Ground, in wet and dry Loams, which are made rich with Manures, for a poor Soil agrees not with it; it is bulky and subject to fall, but folding on it makes it stand.

When sown on a fine well dressed Tilth, it produces a great deal of Grain; its Flour is of the coarsest and heaviest Sort: it may be sown in OCTOBER, and even to FEBRUARY or MARCH you may sow any of the Perks or white Wheats.

There are several other good Wheats in different Parts of the Kingdom, known under various Names; and several of the above-mentioned Sorts are called by different Names in various Places; and several of them are so mixed in sowing, that many large Farmers are not acquainted with the diverse separate Sorts, or their proper Names: nor do I perceive there is any Objection made to their mixed Corn when brought to BEAR-KEY.

That called Cone Wheat is certainly a very good Sort, but the LONDON Bakers think it too sweet to have a great deal of it in the Flour they make their Bread of; they generally buying it in Flour, and Whiteness being a great Article, prefer the red Wheat, and mix them, if necessary. Those who will not go to the Price of the best put in Allom, which gives the Bread a Whiteness, but a poor dry Taste.

The Persian Wheat may be mentioned as a Curiosity, it having five Heads on one Stalk, one in the Middle as long as the Ears of our Wheat, and two on each Side about an Inch long; it is raised sometimes in the Gardens of the Curious: Mr. HAMILTON planted some of it on his coldest Soil in SCOTLAND, having first mixed unslacked Lime with Horse Dung prepared some Time before, with the Earth it was planted on, which brought it to its full Maturity.

All Farmers agree that some of these Sorts of Wheat thrive best on strong stiff Land, and o-

ther Sorts do best on a light Soil; so that it behoves the Farmer to suit his Wheat to his Soil, or work his Soil in the best Manner possible to suit the Grain; and perhaps the doing this right may require the best Judgment and Skill of any one Article in Husbandry.

There is frequently a great Variety of Soils in Lands lying together; nay, even in one and the same Close at a very little Distance; sandy Soils on the one Side, stiff Soils on the other, wet and oozy in the Middle.

After this general View of the different Sorts of Wheat, and of the Soils suitable to them: we shall proceed to treat of it in the Method before mentioned, and first consider how Corn grows.

#### *How Corn grows.*

To know how Corn grows, Experiments have been made of several Grains; and Seeds of various Species have been caused to vegetate in the open Air, without any Aid or Assistance from the Earth.

The Seed on these Occasions is laid on a light Lay of Wool, spread on a Plate with Holes in it; on the Mouth of a larger Vessel filled with clear Water, and after replenished with more as necessary, which draw up an Humidity into the Wool, that supplies the Place of Earth, and nourishes the Seeds.

I have tried the Experiment myself with a brown Pot full of Holes like a Cullender, placed over, or rather in a larger Vessel near full of Water; and it is very well known that the common Warmth of the Sun raises a considerable Quantity of Wet into the Air; which, in this Case, must pass thro' the Holes in the brown Pot, and so keep the Wool moist. And it is also found by the exactest Experiments, that all Waters so carried up, conveys some fine earthy Particles with them.

In a few Days the Wheat, Grains, and Seeds will begin to vegetate; and extend, by slow Degrees, their Roots towards the Water, where they imbibe, however, a less Quantity of Juices than they would from the Earth. Yet they will prosper in that Situation, especially if the Water be frequently changed.

I have compared the Result of thus placing Seeds on Wool, and sowing them in the Earth, and find their Progression to be much the same.

When a Seed has been about two Days in the Earth, the Juices with which it is swelled are imparted to the Bud, and cause it to grow.

The Bud is always situated in one of the extreme Parts of the Seed, and that Part which lies nearest the Surface is the small Root of the future Plant. That on the other Hand which is next the internal Substance of the Seed, is its Stem and Head.

The Substance of all Seeds in general consists of two Pieces, generally called Lobes, and which at first are united by one common Covering; the Structure whereof is more or less solid. These after separate and serve as seminal Leaves to the Plant, and then wither and decay when the Plants have no farther Occasion for them; and these Observations may soon be made of divers Species of Beans and Pease.

The



The Bud of a Grain of Corn which has been lodged in the Ground, begins for the most Part in about four and twenty Hours, or somewhat more, to burst its Foldage, and to disengage itself; after that it shoots out its Root and Stem.

The Root at first is inclosed in a Sort of a Purse, thro' which it breaks its way: two other Roots within the Space of a few Days shoot forth from the Sides, and each of them bursts through the Covering wherein they were inclosed.

All these three Roots are shagged with a vast Number of Filaments, which wind themselves about the little Clods of Earth which they meet with in their Progress.

By this close Adhesion they draw whatever is nutrimental to the tender Plant.

As to the Stem, that shoots upwards in a perpendicular Line; there are several appearing Reasons for the Descent of the Root, and Ascent of the Stem offered by Writers; but there are not any two Things more unaccountable in Nature, than that of Seeds turning themselves downward in order to strike their Roots into the Earth; and the Stem ascending directly upwards, contrary to all the Laws of Gravitation.

Corn will begin to shoot a small verdant Point out of the Ground in five or six Days Time at the farthest after it is sown.

This little Stem is no more than a small Parcel, or Packet of Leaves folded one upon another all round the Ear; which remains for some considerable Time invisible, and is lodged in the Heart.

Tho' the first Leaf of this Packet opens a little toward the Point, yet the lower Part is always confined, and rolled up in the hard Tegument from whence it springs.

Some few Days after, the Covering of the Seed begins to waste away, and the Purse wherein the Roots were contained, decays and dies away when it has performed its Offices.

When the Leaves are duly unfolded, we may plainly perceive the first Draught, or imperfect Sketch of four Tubes, which form the Stem; and at the Bottom we may likewise discover the Bud of the Ear.

From the first Knot which lies nearest to the Roots, shoots out a Leaf, which performs the Function of a Covering to a second Tube; at the third Knot begins another Leaf, which covers the fourth Tube and the Ear.

The Interstice between the first and second Knot nearest the Roots, is then much larger than that which separates the second from the third.

On these Tubes thus jointed as it were, or set one into another, the Ear rises; which may be distinguished with Ease by its round transparent Grains, which bear the Resemblance of so many little Pearls.

At length the Ear shoots from the Foldage which screened it from the Air, and the several Bags or Lodgments which are appointed to contain the Substances of the future Grains, begin to be dilated.

These Lodgments shoot out slender Bodies for

the Reception of the Powders from the Packet of Chives, which make their Appearance above, and render the Buds prolifick.

When the Buds have dilated in those Lodgments, that mealy Substance to which they are united by several Filaments, which may with Propriety be termed the feminal Roots, the Foldage and the first Leaves which, extracted from the Earth and Air such Juices as were proportioned to the delicate Structure of the Stem, begin to waste away.

The Stem then operates more powerfully by itself; it exhausts from the Leaves their nutritious Juices, with a View to enrich the Ear which it supports.

It is Matter of Admiration, that so valuable an Ear should be supported by so tall and slender a Stem; which is deprived of all Manner of Shelter and Protection, and is planted in the Midst of an open Field, where all the Winds have in their Turns full Power to blow it down.

This Grain often ascends to the Height of four or five Foot from the Ground; and tho' the small Stem has no more than two twelfths of an Inch for its Diameter, yet it is contrived according to the strictest Rules of good Economy; for by this Means a small Field will contain an infinite Number of Ears.

This Stem, however, as slender as it appears to be, has been formed with such Art and Ingenuity, that it is thereby preserved for several Months successively unhurt; notwithstanding its being openly exposed to Storms and Tempests, and to all the various Fluctuations of the Air.

Four Knots of a hard Substance resembling the same Number of strong Bands, make it as firm as it is necessary, without rendering it in the least unpliant: it is flexible enough, and qualified to bow without breaking, not only under a common Gale of Wind, but even under the Shock of the most sudden and impetuous Blasts.

By the Assistance of its Knots it is enabled to recover its first Position, as soon as the Storm is over; and it is a very agreeable Sight to view this Forest of Ears under a gentle Agitation of the Wind: each successive Breath of Air makes them bow in their Turns, and seem to roll along the Field like the Waves of the Ocean.

The Ear is formed with no less Art and Judgment than the Stem; the Grains which are in them are ranged one above another, at equal Distances, in order that they may receive an equal Proportion of Nourishment and Support. They are also concealed and secured under various Teguments, which are thick enough to break the Force of the Sun's Beams, and are so closely joined together, that they can exclude and throw off those Dews and Rains which would otherwise oblige them to shoot out.

Several of these Teguments terminate in as many Points of different Sizes; which, as some imagine, are little Ducts or Channels, intended to introduce into each Lodgment a sufficient Quantity of Air; and, according to the Opinion of others, they form a kind of Palisade against the Depredation of the little Birds.



I am apt to believe that these Points, or Beards of Corn, are appointed to withstand and break the Force of those heavy Drops of Rain which fall upon them; by which Means they are discharged from each Side, and from the Surface, instead of penetrating to the Bottom of the Lodgments of the various Grains, which would putrify was the Humidity to continue among them for any Time.

The Process of Nature in the Vegetation of Plants, as exemplified in a Grain of Wheat, is as follows.

The first Day the Grain is sown it grows a little turgid, and the Husk gapes in several Places, and the Body of the Plant swells, and the Gem or Sprout opens and encreases, and the Roots begin to bunch out, and the Placenta, or Seed Leaf becoming loose gapes.

The second Day, the Secundine or Husk, being broken through, the Stem or Top of the future Straw, appears on the Outside thereof, and grows upwards.

The third Day the Pulp of the Conglobate, or round Leaf, becomes turgid with the Juice it has received, from the Earth fermenting with its own.

The Stem from whiteish turns greenish, the lateral Roots break forth greenish, and the lower Root grows longer and hairy, with many Fibres growing out of it.

Hairy Fibres hang all along on all the Roots, except on the Tops, and these Fibres wind about the Particles of Soil like Ivy, whence they grow curled; above the lateral Roots two other little ones break out.

The fourth Day the Stem, mounting upwards, makes a right Angle with the seminal Leaf, the last Roots put forth more, and the other three encreasing have more Hairs, which closely embrace the Lumps of Earth, and where they meet with any Vacuity, unite into a Kind of Network; the Leaf is now foster, and when bruised yields a white sweetish Juice, like Barley Cream.

The fifth Day the Stalk still rising puts forth a Stable Leaf, which is green and folded, the Roots grow longer, and there appears a new Tumour of a future Root; the outer Husk, or Sheath, is loosened, and the Seed Leaf begins to fade.

The sixth Day, the Stable Leaf being loosened, the Plant mounts upwards, the Sheath still cleaving round it like a Bark; and the Seed Leaf is sinuous or wrinkled, and faded.

After the eleventh Day the Seed Leaf, as yet sticking to the Plant, is crumpled and almost corrupted, within it is hollow, and about the Secundine, the Mucus and white Substance of the Seed being continued to the navel Knot, form a Cavity; all the Roots becoming longer put forth new Branches out of their Sides. The second Leaf withers, and its Vesicles are emptied; the Spaces between the Knots grow longer; new Gems appear; and the middle Root grows several Inches longer.

After a Month, the Roots and Stalk being grown much longer, new Buds break out at the first Knot, and little Tumours bunch out, which at length break out into Roots.

The Roots which grow are generally according to the Goodness of the Ground, and the Compass allowed for the Grain of Corn to extend itself in; MILLER says he has traced a Root to the Extent of a Yard, which is farther than I could ever trace one; but with the Allowance which may be proportionably made for the very fine Threads, which could not be taken up. I think I have found some extend two Foot in Length or near it.

Four, five, or six Stems are what is commonly to be met with in the usual Course of Husbandry; each contain, if tolerably good, from thirty to forty Grains or upwards; as I have counted them this Summer both in HERTFORDSHIRE and ESSEX.

I have sometimes met with eight Stems from one Grain, in Corn sown in the common Way which is about three Hundred for one; but that is not very usual. We shall have Occasion to mention this again when we come to compare the different Produce arising from various Grounds, and from Grain sowed at different Distances, in one and the same Grounds; and therefore shall proceed to our second Head: that is,

*How the Ground is to be prepared for Wheat.*

This being a Point of the last Importance to the Farmer, requires a particular Consideration; especially as the New Husbandry gives a quite different Method of Management in this Matter; and more especially as some new Ways of Proceedings in this great Article have very lately been introduced, and are just now struck out by some ingenious Farmers, which I apprehend very well deserve to be set before the Reader in a proper View.

The usual Method of preparing the Ground for Wheat, was formerly by plowing it three, four, or five Times, and dunging it when necessary. This, in general, answered very well, when proper Regard was had to the Nature of the Soil, and the different Seasons which happen; since it has been found, by repeated Experience, that both Frosts and Snows have great Influence on Corn Land, both in the Respect to the necessary plowing it, and also as to the certain enriching it when the Snow falls and lies on it.

For the Frost, when to any moderate Degree, certainly lightens the Ground so much, that the usual Plowings have undoubtedly a much better Effect on it for Wheat; and when it continues any Time, it makes the last Plowing unnecessary, or indeed proper for some Sorts of Grounds, as is evident to every experienced Farmer. And MILLER is of Opinion, that the Ground for many Years after the great Frost, required less Plowing than it did before.

Frost not only lightens the Earth, as before mentioned, but makes it more susceptible of the Air, which certainly not only conveys an unaccountable Quantity of rich Nourishment into the Soil; but by its working Power stills loosens and lines the Particles of it after a very extraordinary Manner; for though it may be hard to say what it is, or however difficult it may be to name or describe it, the beneficial Effects of it are



are found beyond Dispute, which are really so great, that some of our most judicious Writers, and best Farmers are of Opinion, that the great Use and Benefit of plowing, digging, and so frequently stirring the Ground, is principally to make it more capable of imbibing or receiving the Benefit conveyed to it by the Fertility occasioned by the Air and Dews; the Truth of which every one may be convinced of, who will only consider the Riches acquired by his barely fallowing his Land, without any Manure at all; and that it is common to see, in many Places, Land worn out with Tillage, made again proper for it, by only lying some Years uncultivated.

A proper Fineness for the tender Roots of Grain to strike in, is absolutely necessary; but this, in many Cases, might be effected without many plowings.

And indeed all observing Persons agree, that the Air, Rains, and Dews, are replete with great Variety of Particles which are easily made visible, and which have very surprizing Effects both in and upon the Earth, and in and upon Vegetables.

The curious Dr. HALE found, That a cubic Inch of blue Clay being distilled, an hundred and eight cubic Inches of Air were raised from it.

This wonderful and important Fluid the Air, is found to be very operative in every Part of Nature, whether Animal, Vegetable, or Mineral.

It is well known that common Air is frequently impregnated with most noxious Vapours; thus the Fumes which ascend up in the Air from fermenting Wines are very pernicious, and those from bursting Brimstone deadly.

That it is by the amphibious Property of the Air, that the main and principal Operations of Nature are carried on; for a Mass of mutually attracting Particles, without being blended with a due Proportion of elasting repelling ones, would, in many Cases, soon coalesce into a sluggish Lump.

Mr. BOYLE mentions to what a great Number of Miles an Inch of Air may be rarified, and the Force of Fire Engines are visible now in most Countries.

If any Person has a Mind to see the Effect of Water expanded, he may just wet a Bullet Mould, and then pour in a little boiling Lead, which will fly out with prodigious Force; I have seen it strike into a solid Stone, but whoever tries it must be careful to secure themselves, and all about them, from the Danger of its flying on them, if the Hole be any way toward them.

We see the great Power of expanding Water, when heated in the Engine to raise Water by Fire; and Water with Air and other active Particles in capillary Tubes, and innumerable small Vesicles, do doubtless act with a great Force, though expanded with no more Heat than what the Sun's Warmth gives them.

Pease in a Pot near full with Water, on imbibing the Water, have raised one Hundred Eighty-four Pound Weight laid on them; by which we may see the vast Force with which swelling Pease expand. And it is doubtless a considerable Part of the same, which is exerted not only in pushing the Plume of a Plant upwards into the Air,

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but also in enabling the first shooting Radicle of the Pea, and other Grain, and all the subsequent under Fibres, to penetrate and shoot into the Earth; those two very surprizing Powers in Seeds and Plants which we mentioned before, and shall hereafter consider.

But though we have from these Experiments, and from common Observation, many Proofs of the expansive Force with which the fibrous Roots of Plants shoot; yet the less Resistance these tender Shoots find, the greater Progress they will certainly make in equal Times.

Dr. WOODWARD, and others, hence justly observe (as we before hinted) that one of the most considerable Uses of plowing, fallowing, and trenching, and of harrowing of Ground; and of mixing Lime and several other Composts, is to loosen and mellow the Earth, that not only the Roots may make easier Shoots, but there may be a freer and readier Admission of the Dews, Rain, and Air, which are found to have such surprizing beneficial Effects. For the Air has as great and expansive a Force as Water, as is proved by many Experiments.

Notwithstanding this general Truth, a proper Consistency or Stiffness of the Soil, suitable to the Grain sowed, must be preserved; since otherwise Wheat, and some other Grains, will fall. To prevent this good Farmers frequently roll the Ground when necessary, and sometimes fold the Wheat with Sheep, which Practice confirms the Truth and Use of the Observation.

Could we once find out what Consistency or Stiffness each Grain requires, and the Degree and Sort of rich Nourishment most suitable to them respectively; Tillage would be managed with greater Ease, with much more Certainty of Success, and with greater Profit.

These indeed are brought in general to a tolerable Degree of Certainty, as to the Nature of Lands proper for Wheat, Beans, and some other Grains; and some general Rules of fitting Lands with proper Quantities of Marle, Lime, Chalk, Soot, and Ashes, are pretty well ascertained; but yet every Way there is still a large Field open to the thinking Farmer, for the farther better proportioning his Manures to his Lands, than are yet known; and which vary so much as to make a particular Application of more or less, in almost every different Field, fit to be observed.

It may not be improper to caution the industrious Farmer, against over-manuring his Land with any Sort of Improvement, for when Land is made too rich, he will not meet with a good Crop of Corn, but is sure to find a plentiful one of Straw; and this is the Reason, why Farmers, when they are to break up rich Land, generally first take off the Edge of it (as they call it) by first sowing it with Oats, before they sow it with Wheat; and a very good Farmer assured me, that he had lost above fifty Pounds in his younger Years, by making his Wheat Land too rich.

Marle, Lime, Chalk, and Salt, are in themselves excellent Preparatives of the Ground for Wheat, when properly applied, as has been before mentioned; but what is peculiarly beneficial in these is, that they convey no Seed of Weeds,



Weeds, no Insects or pernicious Vermin, nor any thing to sour the Ground, they are brought on or mixed with, but rather help to destroy the Vermin, and likewise sweeten as well as enrich the Soil they are brought to.

And what is equally beneficial, the Course of Husbandry which these require, in order to procure the constant greatest Profit from their Improvements, gives the Farmer an Opportunity of obtaining the continued Advantage of them, without making his Land foul, or filling it with pernicious Weeds.

Thus for Example, Clover, which is found such an admirable Preparative for Wheat, requires no such Culture or Manure, as will give any annual or other Weeds an Opportunity of running to Seed, and so propagating themselves over the Field it is in; it may be improved oft without any Danger; but if the Farmer should lay a little fine Dung on it at MICHAELMAS or in FEBRUARY, yet the Clover being almost perpetually mowed first, either for Seed or Grass, that early mowing will cut off any Weeds which may get in it, before they can Seed. And as the Tops of Clover are generally large and flourishing, so they over-shadow and keep down the Weeds; and if any Sourness should be conveyed by such a Manure, the Clover Tops, and deep Roots, will mellow it before it is plowed up for Wheat, for which one plowing is commonly sufficient.

Much the same may be said of Turnips, another excellent Enricher of the Ground, and Preparative for Corn, whose large Head over-shadows and keeps under Weeds; and the repeated Hoeings necessary in the Management of them, clear the Ground exceeding well from all Weeds and Trumpery, at the same Time that their large Roots are sold to great Profit, or prodigiously enrich the Soil, and frequently answer both those Purposes.

A sensible Farmer of my Acquaintance, sowed Turnips on his Heap of Dung and Soil, solely with a View to keep down the Weeds, not with any Expectation of Profit from the Turnips, though, on our tasting them this OCTOBER, when of the Size of a large Apple, they were pretty good, and not so strong as we expected them to be.

Beans and Pease are also excellent Preparatives for Wheat: a good Crop of Wheat is generally depended on after a good one of Pease.

And here I cannot omit to mention a very extraordinary Instance of a new Improvement in the Course of Husbandry, begun by a Farmer near CHELSEA, this Spring.

He sowed his Ground with Pease in Rows as usual, and as near as I can guess, by what remained of the Turnips, at about twenty Inches distance; and when the Pease were grown up a little, he sowed the Interstices betwixt them with Turnips, and after, as I was informed, let the Pease rest on the Tops of the Turnips; he after reaped the Pease, and sold Part of the Turnips, and on the twenty-second of this OCTOBER I saw two Teams plowing this Ground; one of which, with six Horses drawn double, plowed up a Furrow of eleven Inches deep, and twelve broad; and the other, with two Horses, followed

and plowed the Rubbish about two Inches deep, turning it, and all the remaining Turnips, into the Bottom of the great Furrow.

Many of the Turnips plowed in were very large, and few less than the largest Apples; the Servants told me their Master thought the Turnips would be as good as half a Mucking, and that he intended to sow it as it now lay, and then to harrow it; there was no Appearance of any Rubbish on the Top of all that was finished by the Plows.

What the Success may be cannot be foretold, but in this Procedure, there appears all the substantial Benefit of Horsehoeing, as well as of giving the Wheat that Distance, which we are promised will procure us such advantageous Crops; the Furrows being a Foot distant from each other, betwixt which most of the Corn will fall, after whatever Manner it is sowed.

However, from this Experiment, a judicious Farmer may easily take several Hints which may be of great Service, in a Variety of other Articles.

Lentils, and several other Grains and Grasses, are very good Preparatives for Wheat, when plowed into the Ground, or eaten on it, which different Farmers order according to their different Inclinations; and all may be of Use for Wheat, as will be particularly mentioned when these several Articles come to be separately considered: but Wheat does not love to follow common Barley, as it makes the Land too light for it, and also takes too much of its Goodness from it: it seldom does well after it, though the Ground be in good Heart.

I shall mention but one Article more under this Head, which is that of plowing, and this having been copiously treated of before, I shall say no more of it than what seems absolutely necessary and requisite to inform the Reader, of what I apprehend an almost new Method of managing this Sort of Grain.

The HEREFORDSHIRE Farmers generally plow five Times for Wheat, and shallower or deeper as Occasion requires: and all agree it is improper to plow in Rain or Snow.

The Mode of plowing ought to be varied according to the Nature of the Soil, and the early or late sowing. And it is a common Saying, Sow early and have Corn, Sow late and have Straw.

There is another common Rule said to be a standing one in Husbandry, viz. The more Thorough the greater the Crops; which may be admitted as far as the Soil is more broke, and made finer by that Means. But if it occasion the Seeds to fall closer to each other, so far it disagrees with the modern Method of sowing less Seed, and at a much greater Distance than is usually done, which is now so much preferred to all other Ways.

About DUNSTABLE they plow much in Stitches; and in ESSEX some very good Farmers practise this Method with very great Success; making five Stitches when they come to sow, which five make a Perch, so that between every two Stitches there is a Thorough a Foot wide.

They sow these Stitches length-ways by hand, and a Person used to it will sow for two Teams, each



each of which plows an Acre and an half a Day; and when they have done the necessary Plowings, they run a small Plow drawn by a single Horse, along every Thorough, which casts the fine Mould and Corn each Way on the Stitch, and leaves the Thorough clean.

By this Method, and the sowing sparingly, they apprehend they have all the Advantages that are promised by the Drill Plow; and the Benefit of their Wheat having sufficient Room for its Growth, especially as there are so great Spaces left at each Side of the Stitches.

PLINY mentions the plowing Ground eleven Times, which is thought very strange; but there are two very good Farmers who have several Times plowed their Ground as often: and as soon as the Ground is cleared from the Corn, constantly apply the Plow to it, and repeat it every Fortnight or three Weeks, whilst the Weather will allow, in order to give the Earth the Benefit of the Sun, Air and Dews; and to extirpate and prevent the Growth of Weeds, which grow best at this Time; and by this repeated Husbandry have cleared their Ground so well from Weeds, that I this Year saw Fields of Wheat without a Weed in the Sheaves, or one growing in the Field that I could observe; and one led his Wheat immediately after it was thorn. And by this Method they never have any Smut or blighted Corn, though one of them uses no steeping: and the Land is so mellow, that two Horses and a Man plow an Acre and a half a Day with great Ease; so that in Reality, they have no more Trouble than those who plow less with stronger Teams, and a Boy to drive.

*How the Wheat is to be prepared for the Ground.*

Under this Head there are two Things to be principally regarded:

The first is, what Sort of Seed is to be procured; and what Quantity of it is necessary.

And next, how that Seed is to be ordered.

As to the first, the usual Allowance for Wheat has been named already; whoever approves of the Drill Way of sowing, ought to approve of sowing less Seed than is commonly allowed to an Acre, as it comes nearer in Appearance to the Drill Method of Husbandry, which allows the greater Advantages to the Seed of more Room for the Sun, Air, Dews, and Rain; and greater Compass to spread their Roots in the Earth, which are the principal Benefits proposed to be obtained by the Drill Husbandry, except the saving of some Seed; which, in this Respect, is comparatively of no great Value. But in the common Way of sowing, some Regard is to be had to the Time, since a Peck less will do in SEPTEMBER than after; and a Peck more than common is required in gravelly, and new broken up Grounds: and certainly great Allowances must be made in some Places for the Damage done by Vermin, which frequently devour or carry off the Seed, whilst others are spoiled by lying exposed to the Severity of the Weather.

The succeeding Calculations of what Produce may reasonably be expected from Wheat sowed at several Distances, may probably give the Reader

so clear a Notion of this Matter, as to guide him in his Conduct, as to the common or different Method of sowing his Corn.

But why may not Wheat be hoed at such Distances as the Owner pleases, as well as Turnips? Is not the same Reason that satisfies us of the Prudence of our Conduct in the one, as strong and forcible in the other? The Farmer before named spoke of hoeing his Wheat as well as his Turnips, but has not yet ventured to cut up what I would call the superfluous Wheat; though he finds the hoeing it not only to answer as to the clearing off the Weeds, but also as to loosening the Surface, and refreshing the Wheat: but sure the hoeing Wheat to eight or nine Inches Distance, could be no Hazard of making it too thin; and this near the Thoroughs would answer the Distances proposed by those who seem desirous to allow the largest Compass of ten or twelve Inches to spread in.

But why might not the spare Wheat in one Place be transplanted to Vacancies, which frequently happen in others, or even to fresh Ground prepared for it?

A good Hand with a Trowel would transplant several Hundreds in less Time, and at a less Expence than most Readers would imagine; and Wheat may certainly be transplanted very well: I name a Trowel because that when it opens the Ground for the Wheat, hardens not the Sides of the Holes as setting Sticks do, but leaves the Earth looser for the Wheat Root to strike fresh in.

Every Farmer knows Wheat will bear cutting down occasionally, or mowing at proper Seasons without any Prejudice to it. It is as publicly known that it will bear trampling on by Sheep, when folded properly upon it; and the Roller is frequently also usefully applied to it; and I know it will bear being transplanted, and if prudently done at a proper Season, and in Ground suitable for it, a Man would presently transplant an Acre at a Foot Distance: the Hazard could not be great, and the Profit of its succeeding would be very considerable. Or the Trial may be made on a less Parcel of Land, and on such which the Farmer might not before have had Time to order to his own Satisfaction.

As to the Choice of proper Seed Wheat, there are very few who have that Care in this Particular which they ought to have; for much more certainly depends on good and proper Seed, than most Persons think.

Corn growing on Virgin Mould (as called) or new broken up Ground, is generally allowed to be best of all; and where that cannot conveniently be had, it is very advisable to get Seed from some distant Place at least once in two Years; or if from Land in the same Neighbourhood, let it be from different Sort of Land.

Mr. YELVERTON who gained the Reward in IRELAND for getting the best and most Wheat there, had his Seed from ENGLAND; but where-soever the Seed is taken or brought from, take particular Care that it be perfectly clean and sweet. And it is generally agreed, that the largest and fairest of the Sort should be chosen for Seed; as usually producing the most, the largest, and the best Ears of Corn: which Rule

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generally holds good both in Grain, Roots, Vegetables, and Trees, as well as in Animals; all which commonly partake pretty much of the Parent Seed.

Another considerable Article is the making the Seed perfectly clean from Seeds of Weeds, and Filth of all Sorts, as well as from bad Grains. And in this Case a little comparative Pains at first, will save a great deal of Trouble afterwards, both as to the keeping the Ground sweet and clear from Weeds, as well as from bad and smutty Corn: and this, whether it be sowed dry, or first brined or steeped in some Composition, which is now the most usual Method in managing Seed Wheat, and should in course be next considered.

*Of brining or steeping Seed Wheat.*

As this relates not only to Seed Wheat, but to many other Sorts of Grain and Vegetables, we shall give it a distinct Consideration after we have concluded the Subject of Wheat; and only mention some singular Receipts recommended particularly for the improving of this Species.

We before mentioned the Composition used by Mr. YELVERTON; and shall mention that used by Colonel PLUMMER. But as to the many Compositions which have been much cried up, and sold at a great Price; they have seldom given any great Satisfaction, or procured the desired Success; so that we shall take no particular Notice of them.

*Colonel PLUMMER of HERTFORDSHIRE, Way of steeping Wheat.*

First wash the Wheat through three or four several Waters, stirring it well each Time, and skim off the light Grains.

Put Water in a Tub with a Tap, with as much Salt as will make an Egg swim; then add as much more; stir it very well, and put in two or three Pounds of Allom-beat fine, and stir it well.

Use it as ordinary Brines, only steep the Wheat thirty or forty Hours; for less signifies nothing.

Take the Wheat out the Night before you sow it, and sift some flaked Lime on it. And add fresh Quantities of the Ingredients as wanted.

Mr. BRADLEY observes, That many Farmers steep their Wheat in Brine, yet have smutty Wheat, because they do not make their Brine strong enough; or take their Wheat out too soon.

A late Writer directs to steep the Seed in Rain Water, in which Bay Salt is mixed, till it will bear an Egg, for thirty Hours; and after to spread it on a Floor, with fine Lime mixed with it, and stirred together till each Seed leaves clinging to another, and till it seems candy'd with Lime; and then, he says, doubt not the Increase of your Harvest.

There are great Variety of other Receipts given to the same Purpose; and that which Mr. ELLIS seems to value himself much upon, mentions the dissolving three Pounds of Copperas in two or three Gallons of scalding Water; stir it till it is dissolved; and, when just warm,

pour it over two or three Bushels of Wheat. A Quarter of an Hour after pour over all the Wheat Seed, as much mudgel-hole Water as will make the whole swim four Inches; and stirring it sufficiently, you may skim off all the Seeds of Weeds, and the light Corns that occasion Smut and Pepper Wheat.

The Seed is to lie in this Liquor twelve Hours, or it wanted six, or four, or two Hours; then draw all clear off, and lime it directly for sowing the same Morning; but if the Seed lay and drained twelve Hours first, it would be better.

Care must be taken, that if it be not sowed soon, that it be not left to lie long thick together, which seems agreed on all Hands to be prejudicial.

The Reader will find some Remarks on these Receipts hereafter, when steeping in general comes to be considered.

*Of sowing Wheat.*

This having been treated of before, I shall here only give some additional Particulars.

The Time for sowing Wheat in general, is from the Middle of SEPTEMBER to the Beginning of DECEMBER; but some Sorts of Wheats, and upon some particular Occasions others may be sowed at different Seasons, as was mentioned when the different Sorts of Wheats were described.

But in general great regard is to be had to the Nature of the Land, and the Weather; for though dry Land may be sowed with Care in moist Weathers (tho' not in wet, if it can well be avoided) yet stiff wet Land is only to be sowed in a favourable Time, for fear of the Seed being lost by the Ground's binding, or burst, as it may sometimes happen: but the last may, I think, be avoided with a little Care; as will be mentioned when we come to treat of Steeping.

But it is generally agreed to be much the best to sow the Seed in fresh Mould, and for that Reason they commonly sow as soon as ever the Ground is made ready to receive it.

The sowing the broad Cast way is very well known; but the sowing of Wheat by Hand, sowing or spraining the Seed in along the Stitches, as was before mentioned, and as they frequently sprain in Pease, is not so common; though this latter Manner seems to come the nearest setting in Rows; or sowing according to the Drill Manner of Husbandry.

The next Thing to be considered is,

*How the Wheat and the Ground are to be ordered whilst they are together.*

Now the first Care here seems to be, to get all the cross Gutters and Thoroughts well cleaned, and the loose Mould and Corn in them cast upon the plowed Ground; for which Purpose a small Plough is used in several Places, which is easily drawn by any Horse, and contrived to throw the loose Mould and Corn on both Sides, and leave the Thoroughts perfectly clear and smooth to let the Water run off.

After this there seems three Things necessary to be considered under this Head:

First, What is to be done when the Wheat



is too forward or rank, which would endanger its being laid and spoiled.

Second, What is to be done when it is too poor, and wants some Assistance. And,

Lastly, The great Article of keeping it clean from Weeds, which is commonly the Effect of bad Husbandry; and often the natural Consequence of manuring the Land with mixed Dung full of young Weeds, or with the Seeds of Weeds, which soon spring and spread; and which the Farmer will find it difficult to keep down, and a Work of Years to extirpate. Indeed this is a Calamity the best Husbandmen often suffer by; since it is evident that the Seeds of Weeds are frequently carried by Winds and by Birds; and often lie concealed for Years in the Soil, and sprout up on the Ground being plowed deeper than common, or near to the Hedges.

When the Wheat is too rank, it is sometimes thought proper to mow, sometimes to eat it, and sometimes to feed and fold Sheep on it, as the particular Circumstances require; which last is not only an Advantage sometimes this Way, but also for the improving the Ground when it wants, not only by the Dung and Urine of the Sheep, but by the fining of the Mould by their treading it with their little Feet; and the Nourishment conveyed by the Warmth of their Bodies lying on the Ground. Which two last material Articles seem quite overlooked, or at least very little regarded by some of our late Writers.

As to the Article of refreshing the Ground when too poor, by some additional Improvement. The folding, when proper, answers that End very well; and, in other Cases, the sprinkling on a few Bushels of Soot, Malt, Dust, Pigeons Dung; or any Thing of that Kind will answer the End desired, or even fine Mould or Dung mellowed; especially if the Wheat be hoed as before mentioned, which alone would answer the End of refreshing the Wheat very much, as well as help to keep down the Weeds; which is the great Difficulty the Farmer has to struggle with, and which I come now to consider.

#### *Of weeding of Corn.*

Weeding the growing Corn carefully in the common Way, by cutting them up, or drawing them where it can be done without Prejudice to the Wheat, helps to make the Ground sweet and clean, gives the Grain more Room to grow, and to receive the Benefit of the refreshing Air, the kindly Warmth of the Sun, the fertilizing Dews and Rains. And further, it makes the reaping the Corn easier and cheaper, and saves a great deal of future Trouble in every Article; from the cutting to the carrying it to the Market, and even in the selling it: so that it behoves every prudent Farmer to be careful in this Particular.

This is necessary to be done, and will be a pretty sure present Remedy, as it will keep down the Weeds, and prevent their running to seed, and filling the Ground with a future Crop. But this is only a temporary Help, and not an effectual Remedy, as not reaching the Root of the Distemper, which lies much deeper.

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We before mentioned the Benefit of hoeing of Wheat, and this Summer I saw the Advantage of it, when performed with a small Hoe, and a skilful Hand: for this not only cuts the Weeds, but destroys most of the Roots, so that all Annuals were destroyed; and those of a more lasting Nature, prevented from doing any more Mischief this Season: the Fruit of this hoeing was, I saw not one Weed in a whole Field of Wheat this Season, at the Reaping.

But the Reader must not expect the same Success on one Hoeing, or Weeding; since this Farmer had for some Years industriously extirpated all Weeds, and carefully avoided every Thing which he thought could occasion their Growth; such as the carrying Dung with Weeds in it to the Ground, &c. Notwithstanding which Care, he frequently observed a new Growth of Weeds when he plowed deeper than usual, or near the Hedges; and thought the small Seeds of Weeds were brought by the Winds and Birds, and often lodged in the Cracks of the Earth, occasioned by Heat, or in other Places of the same Nature.

These Remarks of this sensible Farmer are exactly conformable to the Observations of the late Mr. RAY, and other ingenious Writers, who observe, That many Seeds will grow when kept several Years, and most when kept more than one; and that several Sorts had been kept fourteen Years, and some buried so long in the Ground, and yet grew when brought again into the open Air and sowed.

These Remarks will probably give the Farmer a further Insight into the Origin of Weeds, than he might before think of; and put him on carrying his Thoughts further, in order to obtain a proper Remedy for the Disease.

This can be no otherwise procured than by considering, that there are two Sorts of Weeds, those called Annuals, and those Perennials, or which last several Years.

The Annual Weeds will be pretty easily managed, if Care be taken to prevent their seeding both in and about the Ground designed to be kept clear from them. And also, by watching the Composts laid on such Grounds, that they are not full of such Weeds, or with the Seeds of them, which will immediately grow in the Field; and must then be destroyed there by frequently stirring the Ground, and turning them to the Heat of the Sun, or Severity of Frosts, or other Ways extirpating them before they seed, whenever they appear.

Formerly it was customary to throw up Gravel Walks in Winter, in order to destroy Weeds, but the doing it in the Heat of Summer is now found more effectual: and there is the same Reason for, and will be the same Benefit in plowing, or stirring up Lands, in order to destroy Weeds in the greatest Heats, which will generally destroy both Seed and Root.

I presume, the so frequently stirring and turning the numerous Composts now to be met with on every Road, is not only to mix them well together, but to prevent the Growth of Weeds in them.

As to the Perennial, or lasting Weeds, the same Methods will in a great Measure procure the



the same present Advantage; but as they will grow again, and many of them will spread how oft soever they are cut down. There is no effectual Remedy, but the extirpating them by eradicating by a common Dock Spade, used for drawing up Docks, or destroying them by exposing them to the Heat of the Sun, or Severity of the Cold, the former of which is the most effectual; or else by harrowing them off on plowing, and then burning them, as I lately saw practised near CHELSEA, with twitch Grass.

In some particular Cases other Remedies may be applied, for I have known Salt Brine in CHESHIRE poured on Walks to destroy Weeds, and am assured scalding Water will take the same Effect.

Where Salt Water is near it may be properly applied for this Purpose, especially for destroying of Weeds on Dunghills or Composts, but Care must be taken not to apply too much, for fear of the over-salting it, and preventing the Growth of the Corn or Grass for some time; a proper Proportion of which I cannot ascertain, though I have some Experiments now depending for that Purpose; but think the Farmer may very safely pour an Hogshead of Sea Water, or more, on every such Quantity of Manure he designs for an Acre of Land, which I presume will help to kill the Weeds on the Dung or Compost, and also enrich the Ground when it is spread with the Manure.

We before mentioned the Advantage of using such Manures as Marle, Chalk, Lime, &c. in respect to this Article of Weeds, as not conveying any of them to the Ground; and also touched on the Benefit of the artificial Grasses and Turnips, on Account of their giving the Farmer an Opportunity of laying his Dung on the Ground, and at the same time either preventing the Growth of the Weeds which might be in them, or giving him a very good Opportunity of destroying them before the Time Corn comes to be sowed on that Land, by the usual Course of the new Husbandry.

Where the Corn is sowed in Drills at a proper Distance, it will not be difficult to clean it from Weeds by the hoeing Instruments; but great Care must be taken, that the Weeds are tofs'd, or laid so that they grow not again, which they will be very subject to do, if they are trod on when cut, or not laid light on the Ground, free from Soil adhering to them.

*How the Wheat is to be managed when separated from the Ground.*

Here it will be proper to mention the different Methods of managing the Corn whilst in the Field, used by the North and South Country Farmers, with their respective Reasons for their respective Conduct.

In the North Counties, at the Evening, they generally set up about eight Sheaves, close in two Rows, and then cover them with two large Sheaves half opened, and drawn over the Tops of the others, which shelter the whole like a thatched Cover, and will protect all for ten or twelve Days or longer, against all usual Weather, and in Case of excessive Rains the wet Sides of the two Covers will suffer, but very rarely any

other; and it must be a continued long Series of very ill Weather, if the Farmer has not an Opportunity of housing his Corn well.

In the South they set up twelve or twenty Sheaves in two Rows, without any Cover, which they say helps to whiten the Wheat, but if any violent Rain or Wet happen, all their Corn suffers extremely.

Where the Corn is very dry and clean, I have seen it carried away as shorn; but the more usual Method in both Parts of the Kingdom, is to let it stand some time in the Field to sweeten it, and make it whiter, and to ripen any Part which wants a little Weather, and also to kill any Grass or Weeds which may be yet amongst the Corn, and which may be prejudicial to it when in the Barn.

But however different the Sentiments of the Farmers may be, in the Particular above-mentioned, all good ones agree, that it is wrong to house the Corn too soon; and better to err rather in the other Extreme, it being almost a Proverb, "It is better to spoil Corn in the Field than in the Barn."

The next Thing is the mowing it close in the Barn, or setting it on a Stack out of Doors; in both which Cases it is difficult to guard against Vermin, though some are very dextrous in what they call Mowing the Mouse out of the Barn: but the setting it on Posts, or Stones capped with others, which reach over the first on every Side, is generally found the best, and then Corn may stand several Years sweet and good. And in some Parts of STAFFORDSHIRE, and some other Places, they make their Stacks round, a Circle being the most capacious of all Figures, and the most secure against boisterous Storms and Winds, breaking the Force of them gradually; whereas the square ones receive the full Force of the Wind and Wet, and all the Inconveniencies attending them.

But however careful the Farmer may be, Mice will sometimes get into his Stock by one Stratagem or other, and are frequently carried in the Sheaves out of the Field, and are soon of very ill Consequence. It may be known if they are there, by thrusting an Ash Pole, or Poles, pretty far into the Stack, which the Mice will eat the Bark of if they be there, as may be seen when they are drawn out again; for it is well known that Mice will eat the Bark of the Branches of several Trees, and the tenderer the Bark the greater the Temptation, and the easier it is done.

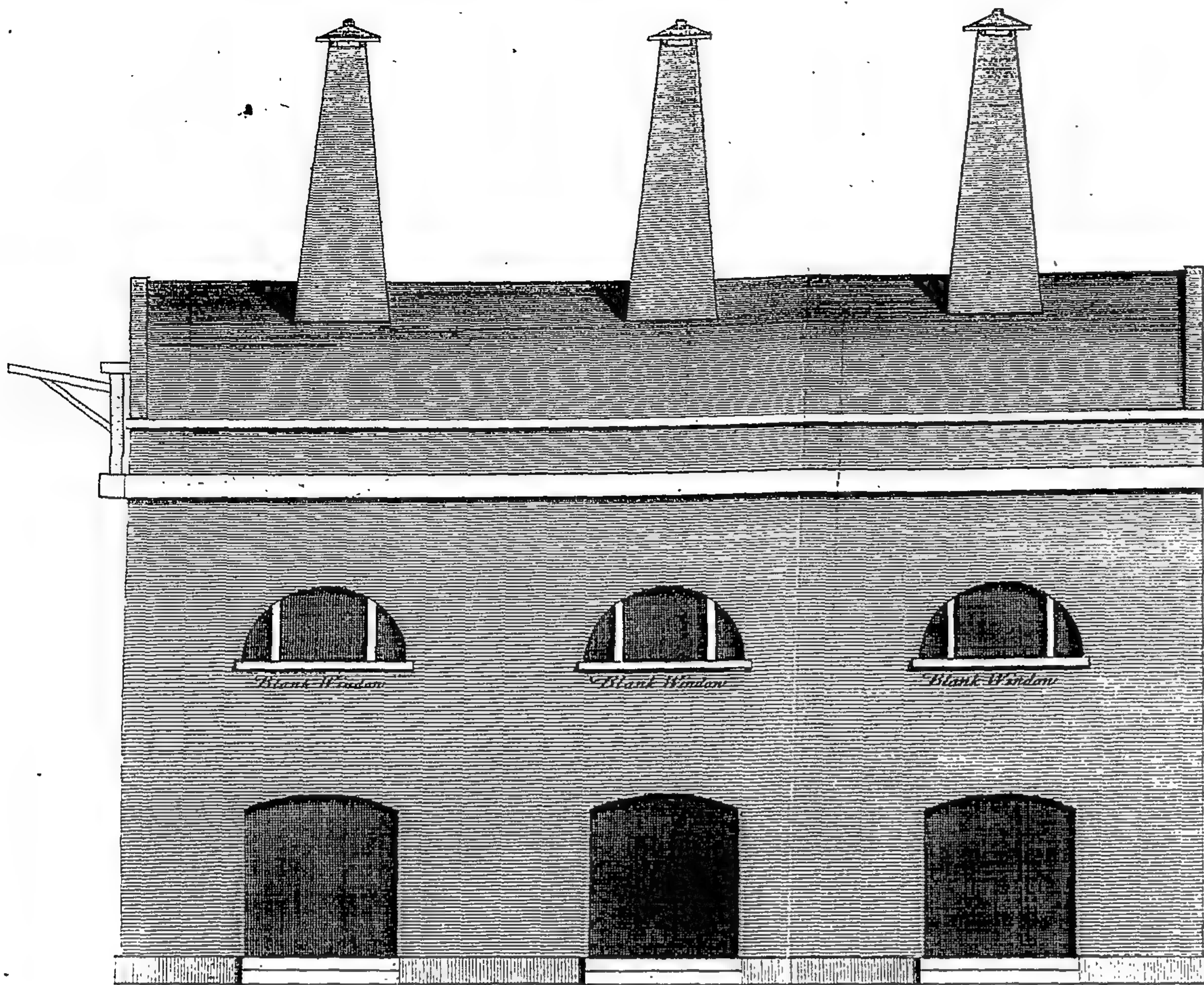
The immediate thatching, or otherwise securing the Stacks till thatched, is certainly very expedient; and often delayed in Harvest to the considerable Prejudice of the Farmer, which might be easily, in a great Measure, prevented at a little Expence, by moveable Covers, as was formerly mentioned.

The Price of thatching, where Labourers have One and Six-pence per Day for doing the whole, is usually Ten-pence for an hundred square Foot.

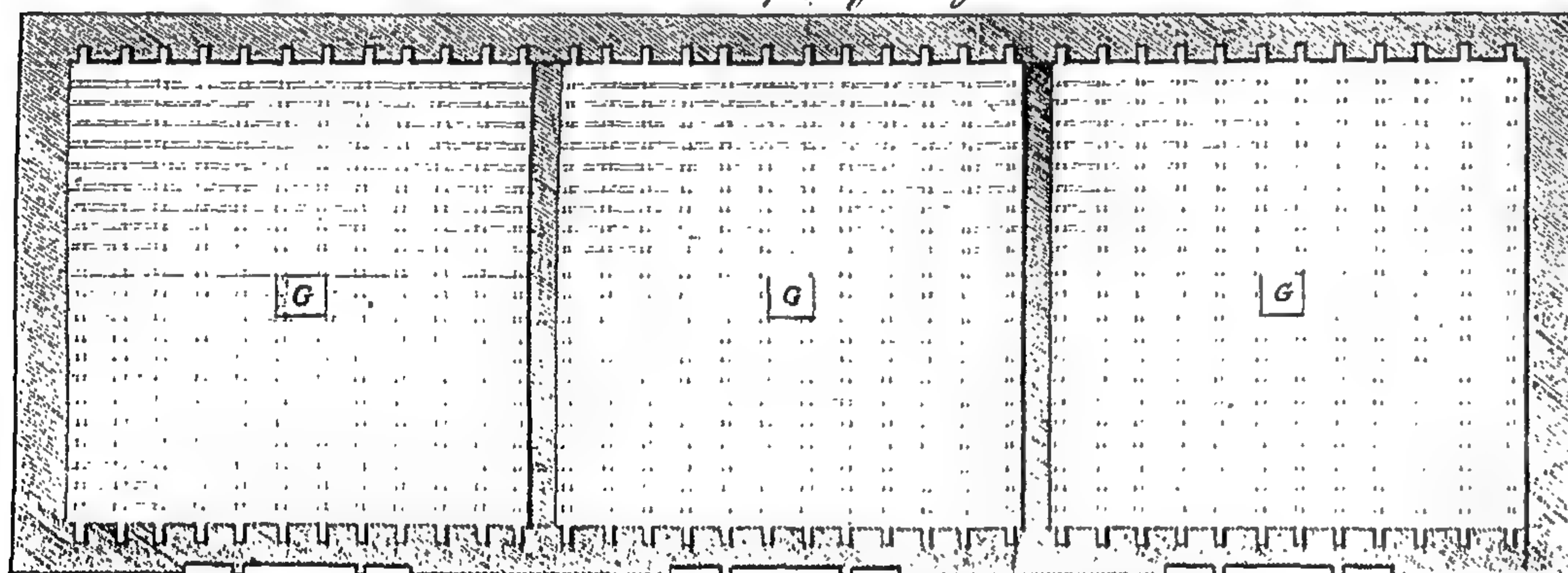
Threshing is the next Thing to be considered, which is generally performed the best and easiest in warm dry Weather, or in Frost; for notwithstanding the Barns are kept as close as possible, the Grain is found to quit the Husk the best in those



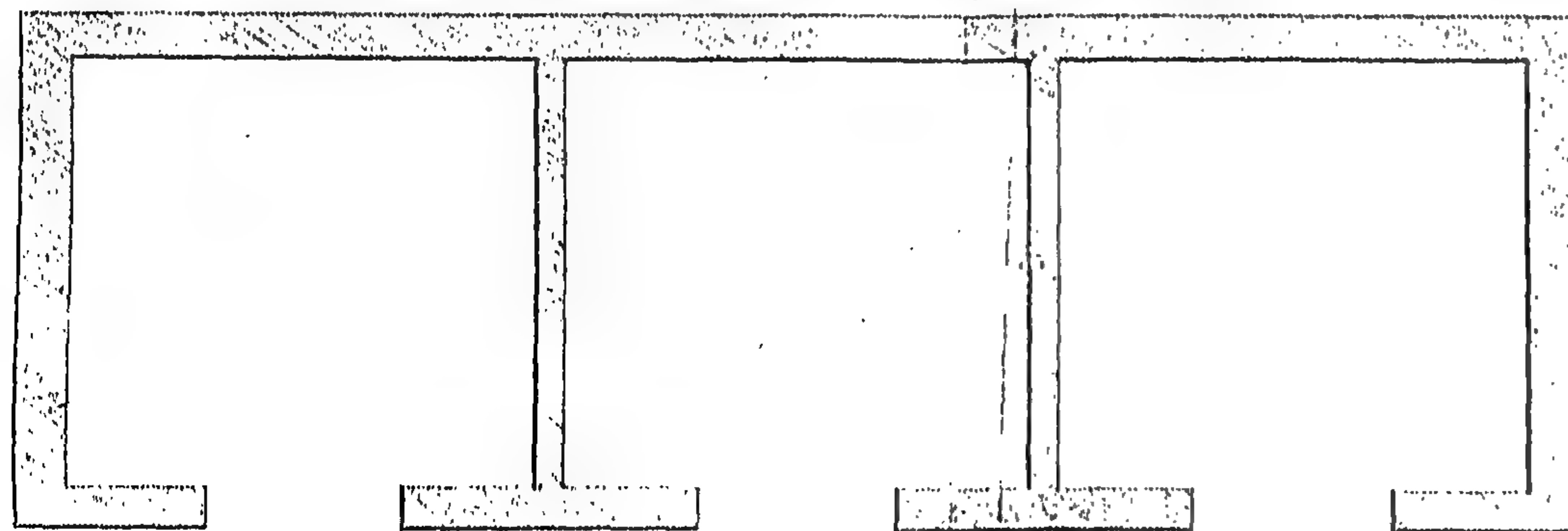
A Ventilating GRANARY for the preservation of CORN in a state of Rest.



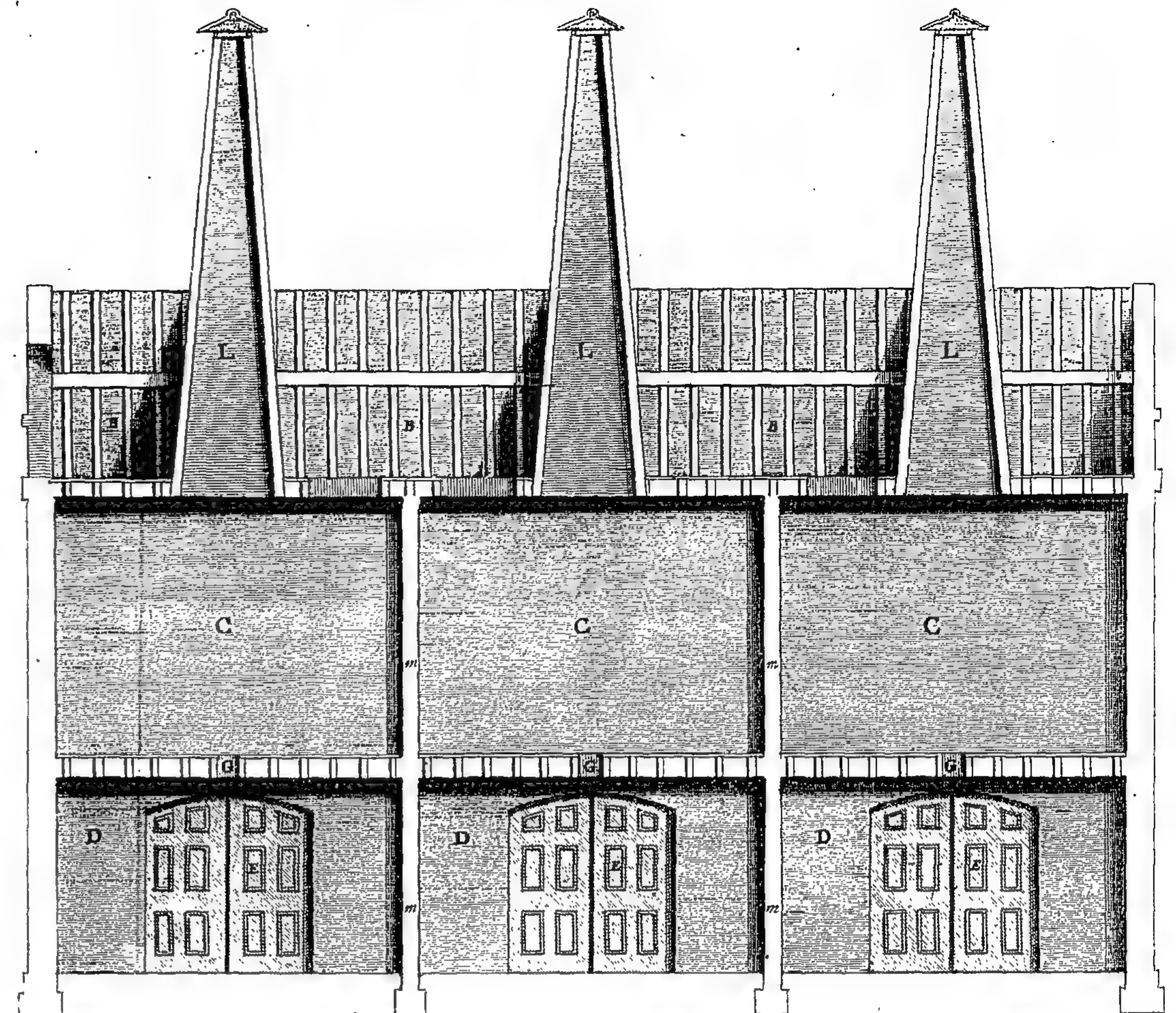
Elevation of the Granary.



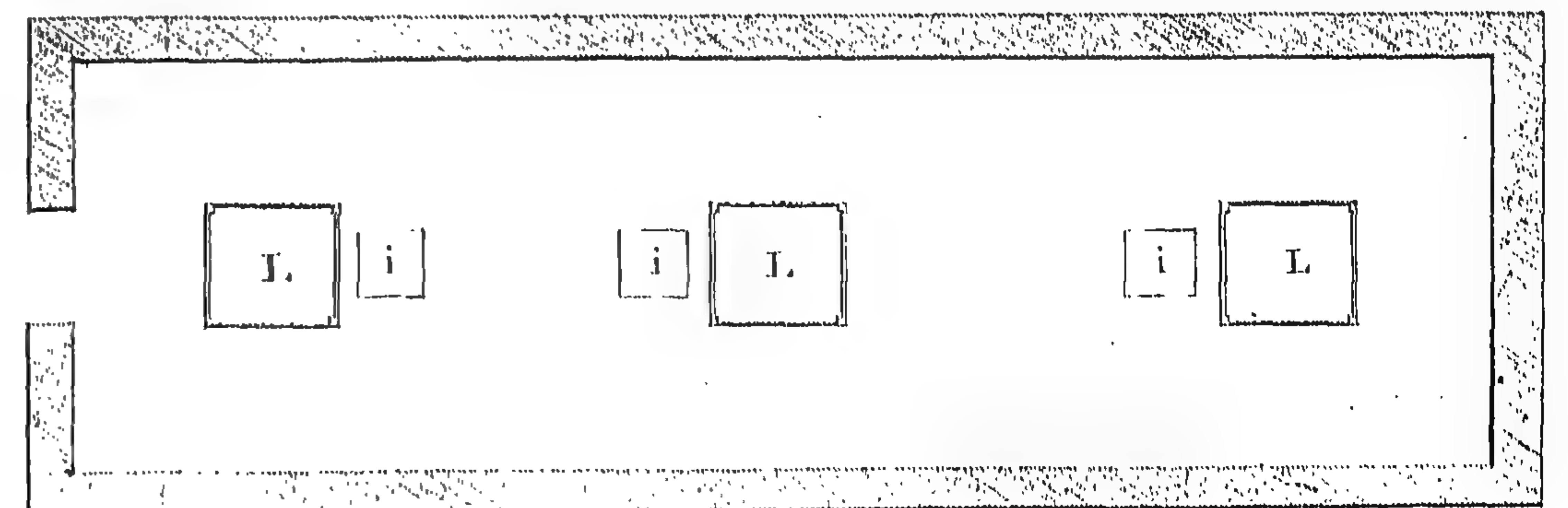
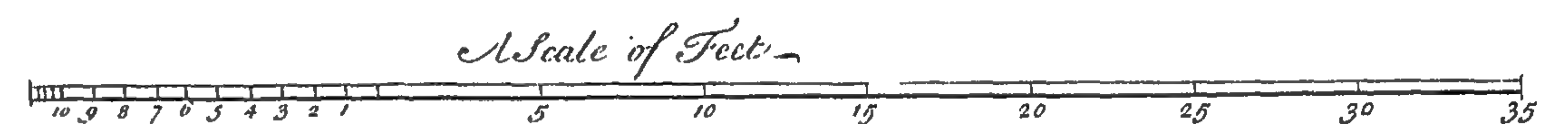
Plan of the Chamber floor where the Grain is to Lay.



Plan of the low floor



Section of the Granary Length ways through the Middle



Plan of the Garret floor

J. M. G. & Co.



those Seasons, which shews what Influence the Weather has, even in this Case, where it would not be expected to occasion any sensible Alteration.

The common Price for threshing, cleaning, and putting Wheat into the Sacks, is two Shillings per Quarter, where the Labourer's Wages are Fourteen-pence per Day at that Season, and must be proportionably less where Wages are less. But good or bad Corn makes a Difference as to the Work, and will have its Influence on the Wages. And so will the Quantity of Grain in the Ears, some having above Forty, some about Thirty, and so on; and here Care must be taken, that the Corn be not damaged, when threshed by lying on a damp Floor too long, before it is cleaned or carried off.

There is a wide Difference even in the Article of cleaning Corn between the South and North Country Farmers; the former cleaning it by casting in the Barn, from one End of it to the other, the best flying farthest, and then separating and cleaning it again after, by the Wheat Ridler, or Fans; whereas the North Country Farmers perform this by Wind, which generally does it very well, and in defect of that have a Fan with Sails, turning on an Axis, which does the Business effectually; and even is allowed the Preference by Mr. ELLIS, notwithstanding his Partiality for the HERTFORDSHIRE Farmers. But to do the South Country Method Justice, a Man and a Boy will clean more than five and twenty Bushels in a Day, as that Author mentions, so that he mistakes in this Point.

The next Thing to be done is to send the Corn to the Market, if the Price be agreeable, or to keep it in hopes of a better, the former Method must in general be taken; but where any Person is of Ability, and has an Opportunity of keeping Corn when it is cheap, by this he has a fair Prospect of promoting his own private Interest; Corn generally bearing double the Price if any one Crop miscarries, which it generally does once in four or five Years. It is well known that the DUTCH have frequently bought our Corn, and sold it again to us at double the Price, to the great Disadvantage of the Nation, by not saving it themselves.

So that, in Reality, he who saves Corn in plentiful Years, may be called a publick Benefactor, as really promoting the publick Good. For it has often been lamented, by wise and good Men, that we have no Publick Granaries, to supply us in a Time of Scarcity: which all wise Nations, and good Governors should take particular Care of.

The Countries most famous for abounding in Corn, were THRACE, SARDINIA, SICILY, EGYPT, and AFRICA.

When AUGUSTUS had reduced EGYPT to a Roman Province, he took peculiar Care of the Bed and Canals of the NILE, which by Degrees had been much clogged with Mud, through the Neglect of the Kings of EGYPT, and caused them to be cleaned by the Roman Troops whom he left there. From thence came regularly every Year, twenty Millions of Bushels of Wheat. Without this Supply the Capital of the World was in danger of perishing by Famine.

When the Emperor SEVERUS died, there was Corn in the publick Magazines for seven Years, expending daily seventy-five Thousand Bushels, that is to say, Bread for six hundred thousand Men.

What a Provision was this against the Dearth of any future Years!

CONSTANTINOPLE was supplied in the same wise Manner as ROME was, when the Empire was fixed there; and an admirable Order was observed in both those Cities, for the Subsistence of the immense Number of Inhabitants.

The Emperor CONSTANTINE caused almost fourscore thousand Bushels of Corn, which came from ALEXANDRIA, to be distributed daily at CONSTANTINOPLE: this was for the Subsistence of six hundred and forty thousand Men; the Roman Bushel serving only eight Men.

To give a later Instance of the Effect of Magazines of Corn, after the fatal Battle to the FRENCH at BLENHEIM, the FRENCH Generals waited on the King, with an Intent to get his Directions how to recruit their Forces, none of them venturing to name the great Distress they were in. The King asked if his publick Magazines for his Soldiers were full, and being answered in the Affirmative, he ordered them to take particular Care that they were kept so. And soon after they found the Effects of that Provision, for there being a Scarcity in general, and good Provisions made for the Soldiers, the Army was effectually supplied with Soldiers without any Compulsion.

These Instances will both convince us of the Wisdom of keeping of Corn, and also that it is possible to do it for many Years, which is next to be considered.

#### *Of the Methods of keeping of Corn.*

There are various Methods of preserving Corn; which may be considered either as they relate to publick Granaries or Magazines, or as they concern and are the Property of private Persons; and as there is at present no Appointment of the former with us, I shall only just mention two or three Particulars about them; and then come to what is within the Compass of private Persons, and what may be of Advantage to those who are desirous to promote their own and the publick Good at the same Time.

VARRO assures us that Corn would keep good for fifty Years, when shut up close in the Ear in subterranean Caverns, which they covered on all Sides with Straw, to defend it against Damps, closing the Entrance with great Care, to prevent the Air from getting in.

This Method of preserving Corn in the Ear is still practised, when Corn is to be sent to far distant Places. And it is sent after this Manner to AMERICA, in Casks perfectly well stopt up, otherwise the Substance will evaporate, and the Plantation of it prove ineffectual.

Another Method is to clean and dry it well, and remove it once in fifteen or sixteen Days, for half a Year; and if it is laid up dry it will need little more Care.

After two Years good Preservation it may be kept forty, fifty, or a hundred Years, by lodging it in Pits which are covered with strong Planks well joined



joined together; or which is a more secure Method, by covering the Surface of the Heap with a small Quantity of Quick-lime, and then dissolving it again by sprinkling some Water upon it with Prudence and Precaution. This Quick-lime will cause the Grain to shoot two or three Fingers in Depth, and form a Surface or Incrustation; which is too strong to be penetrated either by the Air, or any rapacious Insects whatsoever.

In some Cities Abroad they have proper Receptacles for preserving Corn in the Town Walls, particularly at LEGHORN, which being close stopped, kill all Weasles; and keep the Corn good.

There are several other Methods prescribed for preserving large Quantities of Corn; but as there is no Probability of reducing them into practice here, it will be no Advantage to repeat them. But the Reader, no doubt; will observe that the same Methods directed for the keeping of large Quantities, may be made use of to preserve less.

But as to preserving small Quantities for four or five Years, which, in general, is long enough for private Persons in this our Country; the keeping Corn in a Stack set upon wooden Posts or Stones, with Caps over them to prevent Mice getting into them, have been frequently found abundantly sufficient to answer both the proposed Ends; the preserving the Corn good; and the bringing in great Profit to the Owner.

And if it should be found convenient to take away that Stack, and place another on the same Posts whilst Corn continued cheap, there would be no Loss any more than the disposing of the Stack yearly.

And as to the Objection of the Farmer's wanting the Straw for his Ground, and the Chaff for his Horses, as mentioned by a late System Writer; these are Considerations too trifling to be set in Comparison with the Advantages proposed by the keeping of Corn, especially in Corn Countries, in which the Straw is little valued in plentiful Years, and the Chaff often entirely disregarded.

It is common with many Farmers to keep a deal of Corn safe in Bags, and a great Quantity may be secured so in Hair Bags in a little Compass, and placed so that Cats may also keep the Place clean, if kept in common Sacks.

About HEMPSTED they put five Bushels in a Sack, which is above three hundred Weight, which strong Fellows are hired to carry up into the Repositories; though the Custom is a very bad one, and often attended with very prejudicial Consequences to those who carry them, as has been the Case of some I know.

Where full Sacks are used in Rooms or Granaries, I have observed a very commodious little Machine used for conveying them from Place to Place, by which I have seen near twenty Quarters of Corn delivered out with great Ease in a very few Minutes. And as it is very useful in this Particular, and may be easily improved for several other Uses, I shall describe it hereafter.

Some place their Wheat, when threshed, in the Chaff, in the Midst of a Stack of Corn in

which it will lie in a comparative little Compass.

But the most effectual Method is to have a Granary raised on Posts, or Stones capped, as before described, for Corn Stacks: which, if contrived as the Malt-houses are, with several Floors, the Corn may be easily removed, when necessary, from one to another, readily downward; and, by proper Pullies, with no great Difficulty, to the highest; and, by such Removals, kept perfectly clean and sweet as long as desired.

Whatever Method is taken to preserve Corn, the Place where it is kept ought to be free from Damps and all Moisture, as well as from ill Smells of all Sorts; all which soon give a Tincture to the Grain, and make it musty, ill-scented, or ill-tasted.

Few who have made any Observations in Life, but know how soon good or ill Smells are communicated from one Body to another, when placed near together, of which we shall speak more at large when we treat of Steeping and Brining. That Coffee gives a Tincture to Tea, when near it, is very well known, and what we are sensible of. And the Faculties of many of these diminutive Creatures, are much finer than ours, and therefore several Herbs and Compositions may keep them from touching Corn: some Things being immediate Death to some of them, which we scarce perceive. Good dry Wheat ought to be placed in a clean sweet Place for keeping, and it will not be right dry for the Purpose till after MARCH, according to the Opinion of the best Judges.

The Reader will observe, that the Substance of all the Methods for preserving of Corn is much the same, to wit, To have what is good, sweet and dry at first; and to keep it from Air, Wet, and Vermin after.

As to Vermin, the washing the Walls and Floors with bitter Herbs and Drugs, with Leaves of Wormwood, Vinegar, Beasts Galls, &c. is very serviceable, and where there are used Weasles or Worms will seldom bite; and the Ashes of green Oak are said to be the killing of Mites when spread on the Floor.

We before mentioned the Power of Lime slaked in this Respect; and Brimstone seems to have an Effect beyond every Thing of this Kind. It is well known that when a little of it is taken inwardly; it will communicate a Smell through the Body to the Cloaths the Person has on; and, if applied outwardly, will colour Money in the Pocket. Dr. HALL has several curious Remarks relating to it; which, with some other Observations, and a few other Things of the same Nature will be mentioned under the Head of Steeping and Brining of Seeds and Grain. And therefore we shall proceed to the last Thing proposed to be considered, under the Article of Wheat, which is,

*A Calculation of what Seed Wheat is required when sowed at different Distances; and of what Produce may be reasonably expected from each different respective Method.*

An Acre of Ground contains four Thousand eight Hundred and odd square Yards; and in the



the following Calculations, I shall compute it by even Numbers; that is, by five Thousand Yards to be sowed; and making Allowances for Thoroughs, Headlands, and other Accidents, shall reckon four Thousand Yards to produce Corn, we speak here only of the common old Methods of Husbandry.

Now an Ounce of Wheat may be computed by an even Number, to contain six Hundred Grains; and there being sixteen Ounces in a Pound, there will be nine Thousand six Hundred Grains in a Pound: and there being about sixteen Pounds commonly in a Peck of Wheat, there will be one Hundred fifty-three Thousand six Hundred Grains in a Peck of Wheat, reckoning a Bushel of Wheat at sixty-four Pounds.

An Acre of Wheat set at twelve Inches Distance, allowing Seed for five Thousand Yards, for the Reason before mentioned, will take forty five Thousand Grains, not quite five Pounds, or the twelfth Part of a Bushel.

But when the Grain is set at eight Inches Distance, it requires double the Number of Seed: that is, eighteen a Yard, being ninety Thousand Grains, not near a Peck of Wheat.

When the Corn is set at six Inches Distance, there will be thirty-six Grains in a Yard, and one Hundred and eighty Thousand Grains in an Acre, as computed above.

And when the Grain is set at four Inches Distance, there will be eighty-one in a Yard; and, in the whole Acre, four Hundred and five Thousand, not three Pecks of Wheat. And reckoning one Hundred fifty-three Thousand Grains to a Peck of Wheat; and ten Pecks of Wheat, which is the common Allowance of Seed to an Acre, as we usually sow the Ground, there will be one Million five Hundred thirty-six Thousand Grains of Corn to an Acre; and so there will be near four Grains sowed on every square of four Inches; that is, almost a Grain to every two Inches square, or four cubic Inches.

The usual Product of Wheat when reckoned pretty good, is commonly about five Quarters, which is sixteen Times the Seed that is generally sowed, which is a better Produce than they had formerly in many Places. We are informed by CICERO and PLINY, that ten for one was the highest Produce of an Acre, but the ordinary Produce was eight, with which the Husbandman was well content.

The Ears of Wheat usually contain from about thirty to above forty Grains each, and taking forty as the middle Produce (which will be high enough) and allowing twelve Stems to each Grain of the Corn set at a Foot Distance, which is as much as they will bear without the Benefit of Horseshoeing: and reckoning four Thousand Yards (as above stated) to produce Corn, then each Stem producing four Hundred and eighty Grains, there will be in the whole thirty six Thousand Times four Hundred and eighty; which in the whole will be seventeen Millions two Hundred and eighty Thousand. And there being six Hundred fourteen Thousand four Hundred Grains in a Bushel, there will not be forty Bushels in an Acre so set at a Foot

No. 31.

Distance, with the supposed Produce of twelve Stems to each Grain, and forty Grains to each Ear.

When the Grain is set at eight Inches Distance, there will be double the Quantity sowed; that is, eighteen Grains in each Yard, and eight Stems to each Grain of Seed, the Number of Seeds will be seventy-two Thousand; which, being multiplied by three Hundred and twenty Grains arising from eight Stems, the Produce will be twenty-two Millions and forty Thousand, which is about a fourth Part more than what was supposed to be produced from the Seed sown at a Foot Distance, this being somewhat above six Quarters to an Acre.

When the Grain is sowed at six Inches Distance, with an Allowance of six Stems to grow from each Grain, there will be one Hundred and eighty Thousand Grains of Seed; that is, thirty-six Times five Thousand.

And it being presumed there will be four Thousand Yards that will bring Corn, and that each Yard has thirty-six Grains of Seed sowed on it, and that each Stem has forty Grains; that is, two Hundred and forty Times thirty-six, multiplied by four Thousand, makes thirty-four Millions five Hundred and sixty Grains of Corn, which is a third more than arose from sowing at eight Inches Distance; and, consequently, above nine Quarters to an Acre.

When the Grain is set at four Inches Distance, and four Stems allowed to arise from each Grain for four Thousand Yards; there will be eighty-one Times four Thousand Seeds to be reckoned to produce Corn; and then there will be in the whole three Hundred and twenty-four Thousand Seeds, which being multiplied by one Hundred and sixty Times, each arising from one Corn with four Stems, and each Stem supposed to bear forty Corns, the whole will make fifty-five Millions eighty-four Thousand; which will be near a third Part more than those set at six Inches Distance are supposed to produce; and three Times as much as those produce which were set at a Foot Distance, and would be near twelve Quarters, which have been frequently obtained in the common Way of sowing.

If we should go into the Consideration of Grain when sowed closer together than four Inches, we shall come into that Uncertainty of the Distance which falls to the Share of each Grain in the usual Methods of sowing: All these Calculations suppose the common Method of Husbandry to be used; we have shewn before the Quantity procured by Corn set at a Distance and horsehoed.

The Reader will not think that these Calculations are to be depended on as exactly true, since they are only made in order to give him a general View of what may reasonably be expected from setting Corn at several Distances; and, perhaps, may be found in general as near the Truth as can be expected in an Affair of this uncertain Nature; in which the Writings and Practice of others have been of little Service to direct me; but which I have endeavoured to collect from some Rules in Husbandry pretty well established, and from some Rules of Proportion.



portion; which, in many Cases, serve as very good Guides to argue from; and which, I hope, will be of some Service to the Reader.

And if these Calculations be tolerably well founded, then the sowing Wheat in Stitches by hand, as before mentioned, at four, five, or six Inches Distance in the Rows, and in the same Proportion in other Cases, may perhaps considering the unavoidable Loss of many Seeds, and Vacancies of many Places in all Fields, be as good a Rule to go by, as any can be given in general: for, whatever may be said of the great Extent of some Roots of Wheat in Depth and Breadth, four or five Inches either way will be a good Allowance: unless we take into our Consideration the Observations of Dr. HALE, of the great Depths some Plants receive Nourishment from, which they certainly may have the Benefit of conveyed to, or obtained for them, by the Heat of the Sun and Air above, or Warmth of the Earth below; which we shall have Occasion to consider more at large hereafter.

There is one Advantage that may arise from transplanting of Wheat, which may not improperly be added to what was before said on that Head; which is, That by this Means the Farmer may have an Opportunity of giving his Land to which the Corn is to be brought, the Advantage of more Plowing, and lying to sweeten; and also the Benefit of the Winter Frosts and Snows, which all good Farmers know to be exceedingly advantageous to their Land: and what the ingenious Dr. BEAL says on this Subject, cannot but make a deep Impression as to the Benefit which may accrue by this.

" I do often, says the Doctor, ask Gardeners  
" and skilful Husbandmen whether all Sorts of  
" Land are more fertilized, or more speedily by  
" the solar Influence in our Climate, or by  
" Frost; and they generally answer, That Frost  
" and Snow make the quickest Dispatch amongst us, and the more general and richer  
" for Fertility\*. And such a transplanting of  
Wheat, may, in all Probability, be often a great Advantage to the Wheat itself; for whenever that is too rank, it must be eaten or mowed down, or will be spoiled. But such a Removal of it will give a proper Check to its Growth, without any Prejudice to the Wheat. And the taking up of young Trees when they are too vigorous, and setting them down again immediately in the same Place, is practised by Gardeners, and advised by some very good Writers for the very same Reason, that the removing the Wheat when too rank is proposed, That is to give an easy Check to its too forward Growth.

#### *Of brining or steeping Corn or other Seeds.*

We shall first mention the Advantages proposed by this Practice; and then consider the several Ways of ordering it best.

From the brining or steeping of Seed Wheat, or other Seeds, the following Advantages are proposed to be obtained:

First, That it will certainly make the Seed to grow, and come up pretty much together;

and, consequently, have the fairest Prospect of being ripe together.

Now these often happen otherwise when the Seed is not steeped, as part of it may fall where it may be brought to sprout soon, and part lie long in the Ground before it does sprout; and in case a long dry Season follows such sowing, some Seeds, as Barley, and several others, may not come up at all, or in such a Manner as quite to spoil the Crop.

The second Advantage proposed by this Method, or ordering the Seed, is the securing it against Birds, and Vermin devouring it, and its being spoiled by Smut. And,

Lastly, That the Seeds steeped in proper Ingredients imbibe a fertilizing Richness from the prepared Liquor; or by the Lime usually cast on it, and adhering to it, at the Time of the sowing it.

Now, That both Salt and Lime, which are the Ingredients most commonly used on this Occasion, when properly applied, are very great Fertilizers of Land for the producing of Corn, is too plain to need any Proof: the known Use and Advantage reaped by them, puts this beyond all doubt; and that they are equally destructive of Vermin, is also found by the constant Experience of all concerned with Salt and Lime.

And all Housewives know how effectually Salt preserves all Manner of Provision from the taint by Vermin; and it was before truly observed, that the very Smoke of a Lime-kiln effectually clears all who engage in it, from all Manner of Vermin they were before afflicted with; and I have seen Caterpillars drop from Gooseberry Trees, under which a little Lime was flaked for a Trial.

The only Question therefore seems to be, Whether such imbibing of the Brine, or other Liquor, the Seed is steeped in; or the Lime so adhering to the Seed, shall be a sufficient future Security of it against Vermin and Smut, and be a Fertilizer of it in its Growth.

Now we have undoubted Proofs of the long continued Effects both in Smells and Tastes arising from a very short Application of one Body to another; which we may reasonably presume to be the Case of Brines, Soots, Copperas, and particularly of Brimstone, and other Ingredients of the same Nature; and the general Use of one or other of these by most Farmers, seems to confirm the Advantages reaped by them.

Good and bad Crops are undoubtedly got both with steeping and without, the Advice some give to keep the Ground clean and sweet, to till it well, is certainly very good, and ought to be pursued by every sensible Farmer, whether he sleeps his Seed or omits it.

Many are strenuous against sowing the usual Quantity of Seed, and favour the Drill Husbandry; but if little Seed be sown, and nothing done to secure that little against voracious Birds, and destructive Vermin, I doubt they would soon make such Devastation, as would leave many Vacancies free from any Corn at all.

There is an Objection I have heard made against steeping, which is, That when Corn is  
brined

\* *Philos. Transact.*  
vol. II. p.  
731.



brined and sowed in a dry Season, the brined Seed frequently grows mouldy and decays when not covered. But the Steeping, if done right, will set it on sprouting, and it will then struggle hard to live: and it certainly is in as great Danger of being devoured when not steeped, by lying open, as of growing mouldy by being brined. But the usual Quantity of Corn sowed will abundantly supply such little Accidents: and this very Objection seems to shew, that the Steeping preserves it from Vermin, when it is suffered to lie uncovered without being carried off by Birds, or devoured by Insects.

No one seems to deny, that a regular Steeping will certainly produce the sprouting of the Seed, and all the Consequences of it, which is the first Advantage proposed by it.

This Advantage cannot be hoped for, unless it be steeped in a proper Manner; for throwing a little Urine or Salt Water over the Seed is so far from obtaining this first End proposed, that it will rather produce the direct contrary Effect, by occasioning those Grains which happen to be brined, to vegetate sooner than the others which are not brined.

Whereas it must be a regular Brining of the whole that can produce a regular Vegetation of all, which is the first Advantage proposed. And it is undoubtedly on this Account, that in all sensible Receipts for Brining, an industrious and repeated stirring of the Seeds in the steeping Liquor, is so earnestly and so constantly pressed.

And here I cannot but observe, that the first Washing, or repeating Washings of the Seed in fair Water, directed in some of the Receipts, seems to me prejudicial to the End proposed by steeping it. For as the Seed can imbibe but a certain Quantity of Liquid, if it suck first a Quantity of fair Water, it cannot after retain so great a Quantity of the steeping Liquor it would otherwise do; and probably this might make it necessary for Colonel PLUMMER and others to make their Brines so extravagantly strong, when as good an Effect would have been found by a much weaker Brine, applied in the first Instance, or from whatever other Liquor the Grain was to be steeped in.

And as to the clearing of Seeds, light Corn, and such Trumpery: as Salt Water is specifically heavier than fresh Water, that Refuse would rise better on the Brine when the Seed was well stirred than in fair Water; and, consequently, be the easier and more effectually skimmed off.

And here it may not be amiss to take Notice of a Remark or Objection made by a very ingenious living Writer, to Seeds, in regard to the Danger many of them will run of bursting, if sowed in a wet Time, or if a wet Season soon follow; which Danger or Difficulty, or whatever you please to call it, may, I think, when necessary, be easily and safely guarded against, by ensuring them gradually to gentle Degrees of Moisture, according to their Nature; and then committing them, and the Soil they were moistened in, to the open Earth, which I have tried successfully in several Instances. And if we once knew what Degree of Moisture any Grain or

Seed will bear at first, without receiving of Prejudice, it can be no great Difficulty to use them in the Manner they are able to bear at first; and then commit them to the open Air, which they must be sometimes hazarded in, whatever Method is taken in the Management of them. And, I presume, all those Seeds must be forwarded by some strong working Preparative, before they are committed to the Ground, when the Gardeners can raise a Salad during the Roasting of a Joint of Meat, or in a very few Hours.

But to return to Brining.

It seems very plain from constant Experience, from the Reason of the Thing, and the Nature of several Receipts for Brining and Steeping before-mentioned, that many Sorts of Seeds may be made certainly to grow, and that equally as to their Time of sprouting by Brining or Steeping, which was the first Advantage proposed to be obtained by Brining or Steeping of Seeds and Grains. And the next Thing to be considered is, the

Second Advantage proposed by Brining or Steeping Seed or Grain, which is, The securing it against Birds or Vermin devouring it, or its being spoiled by what is called Smut.

The steeping of Seeds was well known in VIRGIL's Time, and that with Ingredients, in order to secure it against destructive Vermin long since. For Sir HUGH PLAT in his Garden of EDEN\*, mentions Lime beaten to Powder, and mixed with Corn before it be sowed, to prevent Rooks and other Fowls from devouring it, and puts a Question, if it does not also help to enrich. And in another Place he mentions, the laying Pease in Water a Day or two before they are sown, and puts a Quest. of steeping in Milk, Spirit of Wine, or Water that hath been long infused on Dung, waste Soap Ashes, or common Ashes, whose Heart and Salt hath not been drawn out before. And mentions some Experiments to procure the Growth of Seeds in a few Hours.†

\* Page 61, 62.

† Part II. p. 20.

What is above-mentioned as then thought practicable, has for some Years been found, by repeated Experience, to be right: and most Farmers now use one Sort of Brine or Steeping Composition or other for several Sorts of Grain: and, we may presume, that so general a Practice, and the Advantages procured by it, when properly managed, will sufficiently justify the Proceeding in the same Course of Husbandry; for I do not find it objected to, that Vermin, notwithstanding the Steeping, still devour the Corn, which happened to a Field of the sensible Farmer before spoke of; who told me, That the Blades of his Wheat (unsteeped) turning yellow, and dying away; on examining into the Ground, he found all the Grain gone.

But as the Methods of Steepings and Brinings are exceeding numerous, and very various, it is next to an Impossibility to chuse out such as will fit all the different Sorts of Grains and Soils; but they all do, or should point at the same End. To wit, To convey something to the Grain or Seed disagreeable or destructive to Vermin and Birds; and which at the same Time may fertilize or enrich them. We will consider the



the former as it falls under this present second Head. And the latter, when we come to the following third Head: and then conclude with some such Observations which may arise from the Whole.

In order to do that Justice to steeping which it deserves, we shall consider,

First, The Reasonableness of such a Procedure; or the Grounds we have to believe that Steeping or Brining will secure the Grain when sowed.

Then those Consequences which repeated Experience hath taught us generally to arise from such Steepings and Brinings.

Now it is not to be doubted but that most Creatures have a Sense of what is agreeable or disagreeable to them, and avoid the latter as far as is in their Power, as is plain when Soot is laid round Vegetables; which, whilst fresh, keeps off Vermin from them.

Again, it is equally evident that several Compositions, or single Things, are fatal to one or more Species of Creatures, which affect not others at all; or so little as not to give them any considerable Uneasiness.

Thus Lime when flaked, Salt, Smoak, and Brimstone, are Death to many small Insects.

Thus the Oil of Turpentine, or Smoak of Tobacco, will kill Moths; and, at the same Time very little affect us, or many other Creatures. And the rubbing of Hangings and Furniture with Sheeps Wool before it has lost its natural Fatness, will stop the Progress of Moths; but do not occasion any Manner of Uneasiness to those who live or lodge in them, any farther than the Smell of the Wool may be disagreeable to some.

But as the Sheep's Wool has this Effect in this Case, may it not be reasonably concluded, that it will operate much stronger against Vermin when the Sheep lies on them in the Fold. It is commonly known that the folding of Sheep helps to destroy Slugs and Worms in the Land, and there is the same Reason to expect the Effect in one Case as in the other. And this well deserves the Observation of the Curious, it never having been taken Notice of that I know of.

Again, the Faculties of these diminutive Creatures are certainly much finer than ours, both as to their Smelling, and their being affected by Scents; of which several Instances might be given of little Creatures. But the curious Smell which Dogs have, and which all Sportsmen, and most other Persons are well acquainted with, would appear very surprizing were it not so commonly known.

Fumes of Brimstone will make Leaves wither, though at so great a Distance from them, as to occasion it by the Heat of it; and to Animals are most deadly.

'Tis thus the Fumes of this Brimstone may be used as an excellent Remedy to destroy Vermin; and it preserves Corn and Bread when packed up to go Abroad.

The ingenious Dr. HALL says, he is told that it is by some such Methods as these, that all the Rats in Ships are destroyed when in the

Harbour. And he farther observes, That the Fumes of burning Brimstone, placed under Corn, will ascend through it with great Velocity and Acrimony.

But if it be placed over it, it descends not, for Ants in a Muslin Rag at the Bottom of such fumed Corn, were not killed by it. Which Observation shews that learned Gentleman's Thoughts of Brimstone in destroying little Animals; and, indeed, the surprizing Effects of Brimstone are scarce credible by those who are unacquainted with it; and we have Reason to think much greater Effects will be discovered from it hereafter. But whoever engage in Experiments about it, had need to use great Care in what they do, there having been so many fatal Accidents occasioned by it.

I shall only add on this Head, the surprizing Effects of the Liquor used by the Bug-killer at the House of a Friend of mine. The House was long terribly pester'd with Bugs, and the Bug-killer took down all the Beds and Furniture, and washed them and the Bed-posts, &c, and the Walls of the Rooms with his Liquor, and then replaced them, and it is now above three Years since; and from that Time there has not been a Bug seen in the House. Nor was the Operation attended with any ill Smell, or other sensible Inconvenience to any of the Inhabitants, the Dogs or Cats. Nor did the Ingredients stain any Thing, or prejudice the Frames of Pictures.

We cannot but observe that here was a visible immediate destroying of the Bugs; and a lasting preventing of their return again for several Years already past; and, in all Probability, (as the Man promised) for many more yet to come.

This Effect must certainly be owing to the Power of the Liquid then used, still remaining, and keeping off the Bugs either by its Smell, Taste, or other destroying Power which the Bugs perceive; but are no Way felt by any other living Creature in the House, as far as we know.

And why may not something of the same Nature be contrived to be proper, safe, and effectual Securities for the several Grains and Seeds both in the Fields and the Gardens, till they are tolerably well armed against these great little Enemies, and their greater ones too.

I know several Farmers who put Arsenick into their Brine for Wheat, and apprehend it very beneficial; but this is a detestable Practice: and what is more surprizing, we are assured, that the Cassida Plant unprepared, poisoneth; but, prepared, is the very Bread of the WEST INDIES.

What is offered above, may, in a great Measure, convince us what Consequences may arise from proper Steeping and Brining, which frequently are the preserving the Grain and Seed from being devoured, when sowed, by either destroying the pernicious Vermin themselves, or giving the Seeds such a Tincture or Crust, as will prevent their eating them: as it is well known the Case is when Soot, Lime, or other bitter Things are applied to, or about the Grain



or Seed, which constantly remain untouched, whilst the Soot, and so on, conserve their bitter Quality.

And indeed all the Things commonly used alone, or in Compositions for brining or steeping Grain and Seeds; such as Salt, Lime, Soot, Copperas, Nitre, Flour of Brimstone, Dunghill Water, Bay Salt, Urine, &c. are generally supposed to have a Power to destroy those Species of Animals so pernicious to Seeds, or at least to preserve the Grain from being devoured by them; or else to be endued with such a fertilising Quality, as to forward the Sprouting and Growth of the Grain and Seed: and most of them certainly have one or other, or all the last-named Qualities. And their Use in preventing Smut depends on the same Reasoning and Experience, as must appear to the Reader from what is before mentioned, and which will be further confirmed by what we shall offer hereafter, so we shall here come to the third Head, which is,

That the Seeds steeped in proper Ingredients imbibe a fertilising Richness from the prepared Liquor, or from the Lime usually cast on it, and adhering to it at the Time of sowing it.

Now the Truth of this will, in a great Measure, appear from the general Course of Husbandry, in applying Manures in order to promote the Vegetation of Grain, Seeds, and Plants; by which some particular Advantages are proposed to be obtained by the Consent of all Farmers. And therefore it may be taken for an indisputable Truth, being founded on Reason, and confirmed by constant Experience, That the Growth of Seeds is to be forwarded by the Application of proper Manures to them.

And on a little Examination it will be found equally true, that some Sorts of Manures promote the Vegetation or Growth of some Grain, Seeds, and Plants, much sooner than others do.

This, I presume, will scarce be disputed by any Farmer, or indeed any Person the least conversant in Affairs of this Nature; however, I will give an Instance or two to put the Matter out of doubt. Pigeon's Dung is undoubtedly richer than Cow Dung; and a Load of any feeding on Animals will encrease Vegetables much more than a Load of Dung of Cattle fed on Straw. This is so plain that there can be no Occasion to add any thing further about it.

These Truths therefore being established, it only remains to shew, that the steeping so short a Time as is usually practised in steeping of Grain and Seeds, may convey a lasting Benefit to the Growth of the Seed so steeped.

And that it may do so is no novel Notion, but has been the Opinion of very considerable Writers.

In the Work of Frustrification I think (says Sir II. PLAT) that Corn itself may be so philosophically prepared, only by Imbibition in the Philosopher's Aquavivæ, that any barren Ground, so as it be in Nature kindly for Corn, shall bring forth a rich Crop, without any Matter added to the Ground\*. And DIONY mentions a Plant of Barley all rising from one Corn, that by steeping and watering with Salt Petre dissolved in Water, brought forth two hundred and forty-

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nine Stalks, and above eighteen thousand Grains. And another Gentleman had from three Spires of steeped Barley sixty, sixty-five, and sixty-seven Stalks apiece from their single Grain and Root, with every one an Ear on, and about forty or somewhat more Corns apiece in them†.

Many other Instances of much later Date, to much the same Purport, might be added; but the Gardiners raising Sallads in a few Hours, and several Greens in a few Days, of which we have had many indisputable Proofs, seem to prove the Point in Debate beyond all Possibility of Contradiction.

For this sudden Growth of the Plant must either be owing to the simple unfolding of the infant Seed into a vegetable Plant, or to the Operation of the Composition used for the Increase of it, and if it would grow so without the Help of the Composition, it would constantly do so; and therefore we cannot but conclude, that proper Compositions applied to Vegetables but for a small Time, may, and do oft convey a very fertilising Power toward the Growth of Grains and Plants, and to Trees too.

This Argument seems conclusive, That a short steeping may convey such a lasting fructifying or fertilising Quality, as will be of a continued Service to the Growth of the Plant.

And we find several Things much more incomprehensible of lasting Impressions made in a very short Time.

We are all sensible how soon the Touch of a Loadstone conveys a lasting Impression to the Needle.

We all equally know that a little Bud from a striped Holly, put into a large green Holly, will gradually occasion the whole green one to become striped, though the Bud dye away.

Many other Instances might be offered, particularly of the wonderful Effects of Poisons, both as to their working at distant Periods of Time, from that they were given; and some times directly.

And we farther find it appear, from several Experiments, and it has been evidently proved by Dr. KEIL, that the Growth of a Tree (to which we may add, and of Corn and Plants) very little lessens the Weight of the Earth in which it grew. Mr. BOYLE had Ground dug up, and Plants only watered with Spring Water; one weighed three Pound, and one fourteen, and the Earth was scarce diminished: and HAZMONT dried two Hundred Pound of Earth, and planted a Willow in it of five Pound Weight, which he watered with Rain, or distilled Water, and covered with a tin Cover; and in five Years the Tree, and all the Leaves it had borne, weighed one Hundred sixty-nine Pounds three Ounces, and the Earth was diminished but about two Ounces.

I tried the same Experiment in order to see how much Turnips took of the Ground, but though sowed in a fresh Soil, and set in an open LONDON Garden, they came to no Substance worth Notice.

But may we not from these, and other Experiments of the great fertilising Qualities of the Air and Dew, reasonably suppose that the steeping Compositions help to expand the unfolding

Plant,

† *Philos. Transact.* vol. IV. 2d part, p. 310, &c.

\* *Good. of Eden*, p. 137.



Plant, and make it more readily receive Additions to its Substance from the Air, Dews, &c.

However this Operation is performed, there cannot surely be any great Doubt of the Truth of the Fact; after what is before-mentioned; to wit, That there are single Things and Compositions which forward the Growth of Grain and Plants, by being applied to them, or by the Grain or Seed being steeped in them, which is what was to be proved.

The only Thing therefore now remaining to be considered, is, whether the Brines or Compositions commonly used, be proper to obtain the desired End, or which of them are likely to be of the greatest Service.

We should here enter into a large Field, were we to mention the many printed and private Receipts which are to be met with about steeping Grain and Seeds, and enlarge on their several Benefits and Disadvantages; to avoid which we shall only add, to those before-mentioned, two or three of the most noted ones relating to Seed Wheat, and then consider a little which of the many Ingredients may be the most likely to obtain the desired End; leaving some Receipts relating to other Grain, to be mentioned when we come to treat of those several Species of Corn respectively.

#### *The Copperas Receipt.*

Put a Tap and Tap Whips into a Tub, and then put in two or three Bushels of Wheat.

Then take three Pounds of Copperas (which is of small Value) and put it into two or three Gallons of scalding Water, which will presently dissolve it with stirring.

Let it cool a little, and then put it all (whilst warm) over the Wheat; a quarter of an Hour after, pour over all as much black Dunghill Water as will make the whole swim four or five Inches, by which, and stirring it sufficiently you may skim off all the Seeds of Wheat and the light bad Corns.

In this Liquor let the Seed lye twelve Hours, or if you be in Haste six, four, or two. Then draw all clear off, and lime it directly for sowing the same Morning; but if the Seed lay and drained twelve Hours before liming, it would be rather better.

The Liquor left may serve toward steeping more, with an Addition of a Pound or two of Copperas.

#### *The steeping used by several MIDDLESEX Farmers.*

At Night put a Quantity of Water in a Tub, with a Tap, then put in five Bushels of Seed Wheat for two Acres of Ground, stir it well and skim off the Seeds of Weeds, and of all light Corn; then draw off the Water and take out the Corn.

Then put more Water into the Tub, and a Pint of Salt, and a Pottle of Stone Lime, which with good stirring will soon dissolve; then put the Wheat in again, and stir the Wheat, the Lime, in the Liquor very well together, and let them lie so till Morning.

Then draw off the watery Part, and lay the Wheat on an Heap on the Floor to drain dry, which it will soon do, ready to be sowed.

If you find the Kernels have not Lime enough about them you may sift on more; but they have, this Way, generally enough lodged on them; the skimming of the Seeds is not here named but necessary.

#### *Another Receipt.*

Throw Bay Salt into Rain Water till it will bear an Egg; in this Liquor steep the Seed thirty Hours, less will not do.

When you take it out spread it on a smooth Floor, scattering upon it good Store of the fine Ground Powder of flaked Lime; sweep it up and down, and mingle it with the Corn, till every Grain leave clinging to another, and become as it were candy'd with Lime, then sow it.

The same Gentleman who fumed Malt with Brimstone, as before-mentioned, also fumed whole Malt in the same Manner very strongly; and being then ground and brewed, it gave no Taste to Beer that he could perceive; and he supposed the Effect of burning it would be, that it might prevent the Beer's working too fast; for this is well known to be the Effect of such Fumes on Wine and Cyder.

He also thus fumed Sea Biscuit, Pease, and Wheat, in a large Vessel, which was repeated again after ten Days, yet they had not much ill Taste. And exposing them for some time to the open Air would probably free them from the very little Taste it gives.

He sowed the Pease which grew, so that the vegetative Quality of them was not spoiled. But the vegetative Quality of the Wheat was thereby wholly destroyed; for none of it grew, though sown three several Times at some Weeks distance; and he adds, it would not therefore be adviseable to fume Corn thus which is intended to be sown.

In the Philosophical Transactions the following Experiments are mentioned.

On the twenty-second of MARCH, 1699. a Gentleman laid to steep a Barley Corn and a Wheat Corn in Brimstone Water.

A Pea, a Wheat, a Barley, and an Oat Corn in Allum Water; and the same in an old Dissolution of Salt of Tartar; in the Caput Mortuum of Sal Armoniac, dissolved in Urine; in a Dissolution of the Salt of Walls; in a Dissolution of Salt Petre; in a Dissolution of Nostoc, or Star Gelly.

He steeped them thus five Days and five Nights, and set them in a Garden in a good Soil, against a North Wall, full in the Sun, on the twenty-seventh of the same Month, after a rainy Night, with a Pea, a Wheat, a Barley, and an Oat Corn unsteeped.

On the Tenth of APRIL following, he found that some were just come up, some were not.

The Pea, the Barley, and the Wheat steeped in Brimstone came all up together.

The Pea steeped in Allum Water was very big and swelled, but not so much as sprouted; but the Barley, Wheat, and Oat above Ground.

The Pea steeped in the old Solution of Salt of Tartar was half come up, the Wheat scarce sprouted, but the Barley and Oat quite up.

The Pea, the Wheat, the Barley, and the Oat steeped in the Caput Mortuum of Sal Armoniac, dif-



dissolved in Urine; were all up together; as were also the next Row, that were steeped in the Solution of Salt of Walls.

The Pea and Wheat steeped in the Dissolution of Salt Petre were about half up, but the Barley and Oat quite up.

Those which were steeped in Nostoc, were none of them come up, nor scarce sprouted.

The Barley and Oat steeped in Urine were come up, but the Pea and Wheat scarce sprouted.

And to his Surprise the Pea, Wheat, Barley, and Oat, that were not at all steeped, were all of them as soon up as any of the former except the Wheat, which was about half up.

They were all set about a Finger deep in the Ground, and there was all the Time of their Growth very fine Weather.

From all which he supposes, that Allum Water is against the Nature of Pease, and retards their Growth, but agrees well enough with Wheat, Barley, and Oats.

That the Solution of the Salt of Tartar is not friendly to the Nature either of Pease or Wheat, but agreeable to the Nature of Oats and Barley.

That the Water of Salt Petre had not any of the great Power or Virtue that he suspected.

And that these Steepings did not further any of the said Grains in their Growth and coming, but plainly retarded some or most of them. He then digged them all up but three Spires of Barley, the Produce of which was mentioned before, and some other Particulars relating to them will be mentioned under the Head of Barley.

In all these last Experiments the Seeds were steeped five Days and Nights, which is much longer than any other Steepings practised that I know of.

I rather wonder that any of them came up at all, than that some of them miscarried; for several Seeds will do well when steeped a few Hours, or a Day or two, according to their Nature, and the Strength of the Liquid, which yet would be spoiled by being steeped longer.

However, we may reasonably conclude, that those which came up when steeped so long would, in all Probability, have succeeded much better had they been laid less Time in the respective Liquids: and therefore we may reasonably hope for Success, by prudently trying some of these Mixtures, or varying them.

The Urine, as mentioned, seems tolerably successful, but in several Trials others and I have made, it has destroyed the vegetative Power of Wheat, and several other Seeds, in less than five Days. But there may be a Difference as to the Strength of Urine according to different Diet.

Much the same may be said about the fuming with Brimstone, before mentioned, to be twice repeated, and then attended with ill Success. As to the Vegetation of the Wheat, which probably might have grown, if it had been sowed after once fuming; and I am the more induced to believe this, because we find, in the last-mentioned Experiments, that all the Grains which were steeped five Days in Brimstone Water came up together.

And as Brimstone seems, from its piercing

Qualities, strong and lasting Smell, and frequent violent Effects, to promise fair for being very useful in this Particular, as it is found to preserve Bread and Corn; the Curious would do extremely well, to make proper Trials of it in different Ways and Manners; which may be done at a very trifling Expence: but in doing of this the Nature of Brimstone requires they should be very careful, for the Reasons formerly mentioned, of the dangerous Effects of it.

In several Trials I made, I kept the Seeds twelve, four and twenty, and thirty-six Hours in the same Liquid, and sowed them severally, at the Times taken out of it; and I have found generally, that Wheat, Turnips, Coleseed, and many others, will grow freely after being so steeped in Sea Water, fresh Water, or in fresh Water salted equally to the Degree Salt Water is; which is made so by dissolving an Ounce of common Salt in a Quart of common Water, there being an Ounce of Salt in two Pounds of Sea Water; as several others as well as I have found on repeated Trials.

In the last-mentioned Experiments the Gentleman seems surprised, that the unsteeped Grains should come up near as soon as those which were steeped; but that is nothing extraordinary, considering that he sowed them after a rainy Night. For I have several Times observed, that the steeping a Day or two before sowing, in moist Weather, is no great Advantage as to the forwarding the sprouting of the Grain: the Reason of which I take to be, that the fair Water being finer, the Seed imbibes it quicker than that made thick by the Mixture of such Ingredients as are commonly used on these Occasions.

And perhaps that long steeping the Seeds which he used, might occasion the stopping of the Passages of the Grain in its sprouting. It is hard to say, with any tolerable Certainty, which Steepings and Brinings are the best, for the several respective Grains and Seeds they are commonly applied to; and to ascertain them in a very exact Manner, the Nature of the Soil, the Season of the Year, the Species and Kind of Grains and Seeds, the several Sorts and different Quantities of the Ingredients to be used, and the Length of Time they are to be applied, ought to be carefully considered and allowed for. In all which we seem at present very deficient, and to labour under very great Uncertainties about them.

Even in the common steeping of Wheat in Sea Water, or in Water in which Salt is dissolved, and the Time the Seed is to lye in it, there is nothing certain yet agreed on; for some think the Saltiness of Sea Water sufficient, others would have their Brine strong enough to make an Egg swim, which is much stronger than the former; and others advise to put as much more Salt again as would make an Egg swim.

And there is as great Uncertainty as to the Time of the Seed lying in the Brine, various Directions being given about it, some naming four Hours for the best Time, some forty, and others different Hours between those two, not to mention that great Variety of Ingredients commonly mixed with or without Brine, and how they operate jointly or severally, used severally by



by different Persons; to omit the different Management of the Seed after it is taken out of the Liquid.

I conceive, they are very much mistaken, who imagine the liming it to be only to make it sow better, which several other Things easier to be had would do full as well; but I apprehend both the Lime and the Salt adhere to the Seed, and not only guard it by their Taste and Sharpness, as long as their Virtues remain, but also communicate some of these their Properties to the growing Plant, and also occasion such a Ferment in the Earth as helps the Plant to proper Juices for its Nourishment.

Lime may very well acquire Heat enough from a Lime-Kiln, to operate a few Days; and the well known Qualities both of Lime and Salt, are to destroy Vermin, and promote the Growth of Wheat.

So that as far as we can rely on our Reasoning in these Cases, or trust to our Experience, Lime and Salt may be safely and plentifully used in steeping and brining of Wheat.

It is very probable that by a few careful Experiments, made at different Times, and in different Ways, this Manner of brining, &c. may be brought to a reasonable and very useful Certainty, as to the general Practice. And perhaps the Wheat itself may be found, when rightly ordered, to imbibe such Quantities only of each Ingredient, as will best answer the Ends desired; and at the same Time refuse such Overplus, or such Kinds of Juices as may be found prejudicial to it.

It will certainly be proper to avoid using Ingredients alone which are too strong for Wheat, such as Urine, when not qualified with some other Ingredient; and not to keep the Seed so long in any Composition, as may rob or deprive it of its vegetative Quality. This may be easily guarded against, by trying any Composition the Reader is inclined to use, or to form from the several Compositions and Ingredients herein before-mentioned in small Quantities, which he may easily make stronger or weak; and steep the Grain in them longer or shorter, and sow it for Trials, all which may be done with a little Care, at a trifling Expence, and then he may adhere to what he finds best to answer his Purpose.

I am not sensible that I have named any one Receipt or Ingredient as used in the brining or steeping of Wheat, but what may be safely used, without pointing out one way or other the Danger or Inconvenience which may arise from it.

And though most of them are very much applauded, yet I have taken the Liberty to touch on some Things, which I apprehend may be altered in them, or where they may probably be applied in a more efficacious Manner.

I have also named some Steepings I have tried, and what may be relied on from them; and as I have several others now depending, I shall be glad to meet with such Success, as to make the publishing of them, toward the Conclusion of this Undertaking, of some Use to the Publick. And if other curious Persons would communicate theirs carefully made, it may be presumed that our united Endeavours will produce what

may be of real and lasting Advantage to the Farmer, the Gentleman, our Country, and indeed to all Mankind.

Lime and Salt are undoubtedly excellent Ingredients, and so are several other Things mentioned in some of the Receipts for brining above-mentioned; and if Brimstone can be brought to be useful in these Affairs, either alone or with other Ingredients, both the Smell, the piercing Quality, and great Power in the destroying of Vermin, seem to promise as fair for its being very serviceable for the preserving of the Seeds of Grain and Vegetables, as any one thing whatsoever.

#### Of BARLEY.

Barley is generally esteemed the next useful Grain to Wheat amongst us, and consequently it ought to engage our second Care; how deservedly it is so, we shall leave the Reader to judge, when we have considered them severally and respectively.

On the Success of the Wheat and Barley in the Corn Countries, our Farmers generally depend for the Payment of the principal Part of their Rents, and for the Happiness of themselves and Families; the other Grains being expected rather to provide Conveniencies for themselves, and to maintain their Stock, than to raise any great Sums for them; and these two Wheat and Barley, are accordingly cultivated with great Care, and commonly at a very great Expence.

Barley hath a thick Spike; the Cup, Husk, Awn, and Flower, are like those of Wheat or Rye; but the Awns are rough, and the Seed swells in the Middle, and for the most Part ends in a sharp Point, to which the Husks are closely united.

The great Use of Barley is to make Beer, which, as well as the Method of making it, is very well known.

In some Counties they make Bread of it, but it is so coarse and unpleasant, that few like to eat it, who have ever tasted Bread made of Wheat; nor will many use it for this Purpose, whilst Wheat continues so cheap in Proportion to Barley, as it has done for several Years past. Wheat Bread, when all Things are considered, being now the cheaper of the two.

It is also useful in the Grain, and when ground into Flour, to be given to the several Sorts of Cattle, and for the feeding of Fowl.

But it is far more beneficial most ways, when made into Malt; for it is then so sweet, and endued with so fattening a Quality, that few Things exceed that Way: and the excellent Mashies then made of it for Horses, and other Cattle, are very well known. This shews the fine Spirit which is originally in this Grain, since neither the steeping, or the drying it for Malt, can take such a Spirit to it.

The great Use made of it by the Distillers, abundantly shews the Spirit that is in it; though I cannot think with a Reverend Writer, that the Revenue it occasions is to be reckoned amongst the good Qualities of the Grain; but must rather think our National Taxes a Punishment for our National Sins.

There



There is some Difference amongst our Writers, as to the Names and Sorts of our Barley; RAY mentions three Kinds.

1. *Hordeum distichum*; common Barley.
2. *Hordeum distichum minus*; Sprat Barley, or Battle-door Barley.
3. *Hordeum polytichon*; Winter, or square Barley, or Bear Barley, called in the North, where it is commonly sowed big.

And he adds, he could not forbear to mention, that LOBELIUS wrote, That the BRITISH Malt Liquors far exceeded all other Northern Liquors of that Kind; of which he was a proper Judge, being a FRENCHMAN, and having travelled in those Countries where Malt Liquors are usually drank.

The Rev. Mr. LAWRENCE mentions four remarkable Sorts of Barley.

First, The long-ear'd Barley, most generally esteemed, for all Uses and all Sorts of Land.

Second, The Sprat, or FULHAM Barley, which is best for rank Land, because it runs not so much into Straw as the common Sort does, and it is thought to yield better.

Third, The Hotspur, or RATHRIPE Barley, which is the earliest ripe of any, being commonly got in, in nine or ten Weeks. Now this is consequently very useful on many Accounts, for that Reason, as it may be sowed later, and will ripen in those Places where the others scarce will grow; and it gives the Farmer the Command of some Weeks, either before the sowing it, or after the reaping, which is often of very great Advantage in the Course of Husbandry, especially since the Improvements made by Turnips; so that he may eat his Turnips longer, or sow later with this Barley than the other, the Advantages of which will be mentioned, when we come to treat of Turnips. And there are Instances where two Crops of this Barley have been got in one Year, from the same Land.

Fourth, Scotch Barley, which this Author says gives the Drink made of it a Taste generally disagreeable to Strangers; and it has also a purging, raking Quality, of the same Nature as Rye, when made into Bread.

MILLER mentions five.

First, The common long-ear'd Barley.

Second, Winter, or Square Barley, or Bear Barley, by some called big.

Third, Sprat Barley, or Battle-door Barley, as Mr. RAY.

And these, he says, are commonly cultivated near LONDON; but unthinkingly, in the very next Page, adds, That the Square Barley, or Big, is chiefly cultivated in the North of ENGLAND, and in SCOTLAND, and is hardier than the other Sorts; but seldom sown in the South of ENGLAND, though it might be cultivated to good Purpose, on some strong, cold, clayey Land, where the other Kinds do not thrive so well. But such Slips as this must be expected, and allowed for in such an Undertaking.

The other two Sorts cultivated in ENGLAND, are,

Fourth, The RATHRIPE Barley, before-mentioned. And,

Fifth, The naked Barley, which makes to-

lerable good Bread, very good Malt, and yields great Increase.

Having, under the Head of Wheat, considered the curious Fabrick of that Grain, and the Manner of the Growth of it; that may, in a great Measure, be applied to the other white Corns: and therefore I shall offer no more of that Kind here.

The principal Uses of Barley, and several of the peculiar Qualities of the different Sorts of it being before-mentioned, we shall not repeat it; but only observe in general, that all these several Sorts of Barley are to be sowed in a dry Season, and at different Times, according to the Nature of the Soils they are to be sowed in, and the Sort of Barley you sow them with. And it may, in general, be sowed from the Beginning of FEBRUARY, but rather in MARCH and APRIL; and the RATHRIPE will bear sowing in the Beginning of MAY, and do very well, especially if properly steeped.

Barley has the shallowest Roots of all the white Corns, and yet stands firm notwithstanding it has a very tender Footing.

It will not grow in many Soils where Wheat will; a leamy stiff Earth is not proper for it, unless it be brought into an exceeding fine Tilth, which it requires, and also as rich a Soil, and as much Culture as any Grain whatsoever.

And as Barley is mentioned to have the shallowest Root of any of the white Corns; it may not be amiss to observe, that a late ingenious Author thought there were not many Grains or Grasses which required above three Inches depth of Soil for their Nurture; whereas both Reason and Experience prove the contrary, and as I may not have another so convenient an Opportunity of considering this Point, I will here mention some Particulars on the Subject.

It was mentioned, under the Head of Wheat, that Mr. MILLER had traced the Roots of Wheat a Yard deep, and I have traced them a great Way.

From the Experiments made by the curious Doctor HALE (which Dr. DUMAINBRAY, in his Lecture on OCTOBER the 29th, 1755. assured us, when they were published surprized all the learned Bodies in EUROPE, and that they examined them and found them right).

From this ingenious Dr. HALE's Calculations of the violent Heats and Evaporations in the Summer Months, and the small Quantity of Dews which then fall, and the little further Supplies which are given to Trees, Corn, and Vegetables, frequently for a long Time together by Rains, considering the great Quantity of Moisture which is daily drawn from, or perspired by the Trees, &c. The Trees, Corn and Vegetables would be dried quite away were they not supplied with Moisture from some other Origin, which he reckons to come from the Moisture in the Earth two or three Foot deep under the Trees: which, together with the Rains and Dews, supplies all the Plants with Moisture sufficient to keep them alive; and, in such a Condition, as is proper for their well being in general.

And since these Experiments have gained such



a Character, I doubt not but the Substance of those which relate to this Particular, will be agreeable to the Reader; especially as I shall only give the Result of his several Calculations, as I have abridged them; since they are certainly very curious, and may be useful on many Occasions, as well as in Husbandry, and will accordingly hereafter be referred to; and to give you the Doctor's own Words as to this Point. "If these Experiments and Observations give us any farther Insight into the Nature of Plants, they will then doubtless be of some Use in Agriculture and Gardening, either by serving to rectify some mistaken Notions, or by helping further to explain the Reasons of many Kinds of Culture, which long repeated Experience has found to be good; and, perhaps, by leading us to make some Advances therein.\*

\* P. 360.

† *Introd.*

"For, the farther Researches we make into this admirable Scene of Things, the more Beauty and Harmony we see in them: and the stronger and clearer Convictions they give us of the Being, Power, and Wisdom of the divine Architect."†

The Doctor apprehends that the Growth of Vegetables is promoted by the Motion of their Fluids, as in Animals; and therefore thinks it reasonable, that in them also, by the same Method of Inquiry, considerable Discoveries may in Time be made, there being in many Respects, a great Analogy between Plants and Animals.

He also examined their several Perspirations, and found that a Man perspires in twenty-four Hours, as Dr. KEILL reckons, about thirty-one Ounces; and the Plant, allowing for Evening and Morning, twenty-two Ounces: so a Man is to a Flower, as one Hundred and forty-one to one Hundred, in this Particular.

He further found that in one and twenty Days in Summer, there were near six and twenty Ounces more Wet evaporated from a circular Area of a Foot in Diameter, than fell in Dews: and therefore justly concludes, "That Plants would then perish, if they had not some other fresh Supplies, either from Rains, or from below; finding the Evaporation to be four Times as much as the Dews that fall in the Night: and we know by Experience, that for much longer Time often no Rain falls.

On the whole he reckons about two and twenty Inches of Rain to fall in his Neighbourhood, near HAMPTON COURT, in a Year; which may be reasonably allowed, considering the several Quantities, which, on the nicest Calculations, have been computed to fall in several Places, as computed by Dr. DERHAM,|| being the Result of many Calculations, as follows:

"The Proportions therefore which I shall now lay down for the yearly Rain of all Places, whose Rain I have had Information of, are these,

"For ZURICH (till further Observations are made) thirty-two Inches and a Half.

"For PISA (till further Observations) forty-three Inches and a Quarter.

"For PARIS nineteen Inches.

"For LISLE four Inches.

"For TOWNLEY in LANCASHIRE, forty-two Inches and a Half.

"For UPMINSTER, nineteen Inches and a Quarter; all of ENGLISH Measure."

Dr. HALE further mentions, That NIC. CREQUIUS found that twenty-eight Inches Depth evaporated in a whole Year from Water; and the Evaporation of the Earth is found to water as one thirteenth to one fortieth; about one third.

The Evaporation of the Earth in a Year is 9-15. (something above nine Inches) from which 9-15 Inches, there are to be deducted 3-39 Inches (above three Inches and a Quarter) for circulating daily Dews; and then there remain 5-76 Inches (five Inches and three Quarters.) Which 5-76 Inches deducted from the Quantity of Rain which falls in a Year, there remains at least 16-24 Inches Depth (sixteen Inches and near a Quarter) to replenish the Earth with Moisture for Vegetation, and to supply the Springs and Rivers.

Hence we find that two and twenty Inches of Rain in a Year, is sufficient for all the Purposes of Nature, in such level Countries as this about TEDDINGTON near HAMPTON COURT.

But it plainly appears above, that the Evaporation in Summer frequently far exceeds all the Dews and Rains which fall then for a long Time; and, consequently, the Heat would then destroy all Plants, unless provided for some other Way.

In order therefore to find out what Stores of Moisture Nature had provided in the Earth, against the dry Summer Season. The last of JULY 1724, the Doctor dug up three Cubic Feet of Earth, three Foot deep (and mentions the Soil, &c. of the Place.) And when those several three Cubic Feet were become so dry as not to be fit for Vegetation, on weighing them several Times, he found the first Foot (the highest) had lost six Pounds ten Ounces of its one Hundred and four Pounds four Ounces, being the Original Weight. That the second had lost ten Pounds of its original Weight of one Hundred six Pounds six Ounces and a Half. And that the third had lost six Pounds ten Ounces of its original Weight of one Hundred eleven Pounds and one third. Which together amount to twenty-five Pounds two Ounces; and the Doctor apprehends this a sufficient Reservoir for Plants in general, in dry Summers and dry Times: for several Plants strike deep into the Earth, the Root of the Sun-flower he made the Experiment with, reached fifteen Inches into the Earth; and, consequently, would draw Moisture much deeper in dry Times than the Depth its Roots reached.

And it is necessary to consider the Heat of the different Times of the Year, and how far that may affect the Generality of Plants; and what they can bear, before they will be burnt up and destroyed.

Now in regard to the Heat Plants can bear, the Doctor observes, That they will bear without Prejudice a greater Heat than that when Water is heated to the greatest Degree, he could bear his Hand in without stirring it about; and mentions the following Degrees of Heat at different Times:

"That

|| *Philos. Transact.* vol. IV. part II. page 82.



“ That in JULY the common Noon-tide Heat in the Sun is about fifty Degrees.

“ That the Heat of the Air in the Shade in JULY, is at a Medium thirty-eight Degrees.

“ That the MAY and JUNE Heat is from seventeen to thirty Degrees, the most general Heat for the Generality of Plants in which they flourish most, and make their greatest Progress in Growth.

“ The Autumnal and Vernal Heat may be reckoned from ten to twenty Degrees: the Winter Heat from the freezing Point to ten Degrees.”

The Doctor farther observes :

“ That in JULY the Heat must have a considerable Influence at two Foot deep, by Night as well as by Day.

“ That the Dew in a hot Day cannot be of Benefit to the Roots, but is imbibed into the Vegetables:

“ And that Nature has covered Roots with a very fine thick Strainer, that nothing shall be admitted into them, but what can readily be carried off by Perspiration; Vegetables having no other Provision for discharging their Recrement.”\*

\*Page 85.

Since a plentiful Perspiration is found so necessary for the Health of a Plant or Tree, it is probable that many of their Distempers are owing to a Stoppage of this Perspiration by inclement Air.

The Perspiration of Men is often stopped to a fatal Degree, by Intemperance, violent Heats; and that of Vegetables by inclement Air, unkindly Soil, or want of a genial Moisture.

By comparing the Root, and the Plant above Ground, we see the Necessity of cutting off many Branches from a transplanted Tree; for half the Root being cut off, (which is the Case of most young transplanted Trees) it is plain it has but half the Nourishment, besides its being put in a loose Position.

This (as well as Experience) strongly evinces the great Necessity of well watering new Plantations; which notwithstanding what MILLER says; that nothing being more injurious to them than over watering;†

†Page 14. 17.

*How the Ground is to be prepared for Barley; and of steeping and sowing it.*

Barley (as before mentioned) requires as fine a Tilt, and the Ground to be in as good Heart as any white Corn whatsoever. And accordingly, before Turnips came to be so much cultivated, the Ground was generally prepared by a Fallow; a Manuring, and several Plowings. And the Vale Men who get not Turnips, use much of the same Husbandry; or else fold it with Sheep, or get twenty Bushels of Pigeons Dung; and spread it on an Acre; when the Barley is sowed; and harrow it in with it.

But since Turnips have prevailed so much, they are found generally to prepare the Ground very well for Barley, and now it is commonly sowed after them; when it is easily brought to a fine Tilt, and when the Ground is in good Heart, there is no great doubt of a good Crop.

The Care to provide good Seed, and to make it perfectly clean, is so generally to be done in

all Grain, that it need not be here insisted on, only just mentioned; and the Change of Seed yearly, or once in two or three Years, is also found very advantageous: and in the Case of Barley, that from sandy short Loam is found the best for stiff Land, and that from stiff for sandy:

In very dry light Soils it may be sowed early in MARCH, or any Time after; but in stiff Soils not till APRIL, and sometimes not till early in MAY. But in such late Sowing, if the Season does not prove favourable; you run great Hazard as to the having a good Crop; and may be assured it will be a late one, which is generally attended with ill Consequences, and very often with fatal ones; especially if the Barley be sowed late, and not steeped; and a dry Time follows. In which Case, at best, the Seed lies long exposed to Vermin, often comes up unevenly, and sometimes not at all.

#### *Of Steeping.*

Whatever the Season is, a moderate Steeping of Barley, cannot be attended with any considerable Inconveniencies, and may produce many great Advantages; as are mentioned at large under the Head Steeping. And when you steep, you may manage it in the same Manner as directed for Wheat; and almost any of the Steepings mentioned will make it grow; as fair Water will, as is well known by the putting it into the Cistern with Water in order to malt it.

The Vale Men steep it in Salt and Water in which an Egg will swim, twelve Hours; and some in Water in which Lime is dissolved; or sift dry Lime over it.

The Rath-ripe Barley, as was before mentioned; is soon ripe; and, consequently, there is little Danger in sowing it late, since it frequently is ripe in nine Weeks, from the sowing and seldom exceeds ten. But as the late Sowing must probably carry it on to a drier Time; there will be the more Occasion to steep it.

The common Allowance for Seed Barley is from four to two Bushels, according to the Time of sowing; the Sort of Grain, and the Nature of the Soil: and taking three Bushels in the Medium, the Produce being four Quarters; it will be about eleven for one. Whereas if only one half of the three Bushels grew; and produced but two Stems, that would be sixty Bushels; which is twenty Times the Seed; and I have known some large Fields to answer this Calculation.

A late voluminous Writer applies here the common Saying of, “ The more Furrows the more Corn; which is very inconsistent with the Drill Husbandry, and setting the Seeds at a great Distance; which he recommends so warmly.

Mr. HAMILTON in SCOTLAND set a Handful of Barley at six Inches Distance; which, in three Weeks, covered the Surface; and produced seven Sheaves; but they being stolen; he could not be sure of the Produce.]]

|| Append. P 42-

Mr. MILLER thinks four Bushels too much; it being his Opinion, that we generally sow too much of all Grain. And if the Seed could be insured against Vermin and Accidents, and be certain



certain to grow, it would be no great Difficulty to ascertain the Quantity.

Many others seem of the same Opinion in this Particular, that we generally sow too thick; and this seems to concern all, or most Sorts of Corn. I made several Calculations under the Head of Wheat, of what Produce may reasonably be expected from Grain sowed at different Distances in the common Husbandry; which may, in a great Measure be as applicable to Barley as Wheat; and therefore no more need to be said as to that here; only that the Method there mentioned of sowing the Furrows by Hand, may probably answer as well for Barley as any other Method whatsoever.

The Manner of Plowing has been spoke to before, as well as Rolling; the latter of which is frequently absolutely necessary; and, when rightly timed; and prudently managed, is always advantageous. It should be done after the first Shower of Rain after the Sowing.

#### *Of weeding and reaping of Barley.*

No Corn is generally thought to suffer so much by Weeds as Barley, and therefore a very particular Care ought to be taken to preserve it from Weeds, or to clean those out which are got into it. The common Way of weeding Barley is very well known, and some Weeds will get into it either by Accidents, or by lying long in the Ground, and being fresh raised up, as was before mentioned.

This is usually done in JUNE, and if the Corn be then thin, a little Pigeons Dung, Malt Dust, or any Thing of the like Nature will be of great Service to it.

But if the Ground be duly managed, according to the Course of the new Husbandry, the Ground will not be filled with Weeds carried thither with improper Dung, which is often the Case. And if the Barley follow Turnips, as it now generally does, the Preparation of the Ground made for the Turnips, and the usual twice hoeing them; if carefully done, will cut up every rising Weed. To which, if we add the Turnips after over shadowing the whole Ground, and by that Means checking the Growth of any Weeds or Trumpery; all together, must keep the Ground pretty clear from them. But if there should still remain any Signs of this Evil, the Farmer may turn up the Soil two or three Times to the Winter Frosts, before there will be Occasion to sow his Barley. The Method of managing which to the greatest Advantage, will be mentioned when we come to treat of Turnips: and surely by some, or all of these Ways and Means, the Barley may be sufficiently preserved or cleaned from Weeds; which will be very advantageous not only in the growing Grain, but in the Case of Sheering or soon Housing, Loading, Threshing, and fitting for the Market.

After the well clearing of the Barley from Weeds, we may reasonably hope for an easy and expeditious Way of Reaping, and getting it made safe.

Now there is a very wide Difference in the Manner of reaping of Barley, between the Practice of the North Country and the South Coun-

try Farmers: the former of which generally shear and bind, and shock it clean and carefully as they do their Wheat; by which Means it is kept from all those Inconveniencies which frequently happen to it by its lying on the Ground, and being also exposed to all the Inclemencies of Weather.

But as this is a Corn not subject to shed, and the South Country Farmers principal Concern is, to take effectual Care of their Wheat; they commonly mow it, and a Man will this Way cut two Acres a Day, which is certainly a much quicker Way of dispatching it, and so far done at a much less Expence. After this, in some Places, they let it lie a Day or two, and then turn it; and after a Day or two more, as the Weather favours, and the Weeds are killed, they gather it in Cocks, as they usually do Hay, and then load it.

In other Places they let it lie after it is mowed, till they apprehend it is dry enough to load, though it be many Days, and rake it both Ways on Heaps, turning it up a little before they load it. However, in those Places where they meddle not with it till they are just ready to load it, they are very nice in laying the Ears on that Part of the Swath where the Scythe points out, and is the highest; which they apprehend keeps it hollow, and lets the Wind under it to dry it: and they are also careful in keeping the Ears even together when they rake it. In some Places they have Forks with three large Tines, two under, and one rising a good deal above it, by which they shove the Barley both Ways on an Heap.

A Reverend Author calls these last Ways, "The lazy and slovenly Custom of the South," but I rather attribute it to the want of Hands in the South, where they have much greater Corn Harvests than those in the North.

The CHELSEA and FULHAM Farmers, who are thought to excel in the Management of this Grain, will, in a dry Time, sometimes cock it in a Morning, whilst the Dew is on it, to give it a little Sweat; and a little Rain on it whilst it lies in the Swath, is thought rather advantageous than prejudicial to it. Some mention their letting it lie abroad as giving it a finer Colour.

#### *Of the Produce and Advantages of Barley.*

A late ingenious Writer mentions the common Produce of Barley to be, Two and a Half or three Quarters on an Acre; but that he has sometimes known four Quarters on an Acre. I presume, he here speaks of what is got amongst the middling Farmers, since he himself mentions much greater Quantities of Barley on an Acre.

Four Quarters in the common Course of Husbandry, is generally reckoned a good Crop; but that allowing for the usual Trouble and Expence of Fallowing, Dunging, and repeated Plowings, will not answer so well to the Farmer as is commonly thought; as will appear from the following Calculations: in which I shall allow three Quarters and an Half as a common Crop, and value the Barley at two Shillings a Bushel, which is as high as has been  
some



some Years, or as it is likely to be whilst Wheat continues so cheap as it has lately been; Barley being usually reckoned one half the Value of Wheat.

Now here the whole Produce would be two Pounds sixteen Shillings, and deducting the Outgoings, that is, Seed three Bushels, six Shillings; the usual Plowings, Sowing, Harrowing, and Rolling, twelve Shillings; Weeding, Reaping, Threshing, and Cleaning, the Straw being of little Value, eight Shillings; extraordinary Dung or Dressing, one Pound; Rent eight Shillings, in the whole two Pounds fourteen Shillings: so that there is very small Profit to the Farmer, above paying him for his Trouble.

The common Profit of the usual Produce of Beans and Pease is much better, as will after appear, and they help to improve the Ground for a Crop of Wheat; whereas it is generally allowed, that Barley impoverishes Land very much, and on moderate Computations a Crop of Oats, Clover, or Turnips, will be found to pay the Farmer better.

But by the late Improvements made by the new Husbandry, a considerably greater Profit arises from a Barley Crop, taking the Produce to be the same; for the Loss of the Fallow Year (the Rent of which was not reckoned to the Outgoings of Barley, as it might be) is answered by a Crop of Turnips, which will pay the Rent and what Manure is necessary, and the Husbandry of them; by which Method much less plowing is necessary for the Barley; and by this Means, all Things considered, one half of the Outgoings in the preparing for Barley is saved, which consequently is so much clear Gain to the Farmer.

But there is another very considerable Advantage may be said to arise from Barley, according to the new Course of Husbandry; which is, That Barley, of all Grains, is the best qualified to admit the sowing of a beneficial Crop of Clover in it. And Clover being the best Preparative for a good Crop of Wheat, at an easy Expence, and Wheat paying generally much the best of all Grain, the producing or promoting so excellent a Crop, may reasonably be allowed as an Advantage arising from Clover.

A very ingenious modern Writer indeed thinks the sowing Clover with Barley, to be no good Practice; and is for sowing it alone in August, thinking the sowing it with Clover to be the Loss of a Year: but in this he is certainly mistaken, since by sowing the Clover with Barley in the Spring, it plainly gains as much Time as it grows from the Spring when it was sowed with Barley, till August, when it is supposed to be sowed alone, and all is in the same Year.

And as to the Goodness of the Clover when sowed with Barley, I have carefully enquired of some very sensible Farmers, their Opinions as to this Point; and was answered that they had as good Crops of Clover when sowed with Barley, as could well grow: and I have seen some such myself, and particularly one this Summer, at Mr. Wood's, at BROCKSHALL, near KELVEDON in Essex; which being very good, I shall here give some of the Particulars relating to it.

Last Year he laid down a Field of twelve  
N<sup>o</sup> 32.

Acres with Clover, and this MAY, 1755. he turned into it to eat it, twelve Horses, eleven Cows and a Bull, ten Oxen, eight Heifers, and one Hundred Sheep, and thirty Hogs; and kept them there till about Midsummer, six Weeks at least, and then saved it for Seed.

I saw it finely grown in SEPTEMBER, and about the End of that Month, he got from it four and twenty Waggon Loads of good Clover. It may be difficult, at present, to compute the Value of all these, but it cannot well be reckoned at less than Sixty Pounds.

But the Produce of Barley being frequently found much larger than what is above-mentioned, may well deserve some Considerations about it.

MILLER says it is very common to have ten, twelve, or more Stems from one Corn; and that he has counted seventy Stalks of Barley from one Root, which was transplanted.

In the Experiments mentioned before from the Philosophical Transactions, the three Spires of Barley steeped there as before-mentioned and set at two Foot distance, had sixty, sixty-five, and sixty-seven Stalks apiece from their single Grain and Root, with every one an Ear on, and about forty or somewhat more Corns apiece in them (which, at forty in an Ear, amounts to seven Thousand six Hundred and Eighty Corns from the three Grains; being above two Thousand five Hundred from each single Grain) this great Success the Author thinks proceeded not so much perhaps from the Grain, having been steeped in any Liquors, as from the Fertility and Goodness of the Soil, and their competent Distance one from another.

The same Gentleman further observed, that new Shoots continually struck up from the Roots; so that here, if the invigorating Heat of the Sun had not been cooled and weakened by the Approach of the Winter Season, there would have been continually new ripe Corn, and empty Ears on the same Root \*.

Now this may afford Matter for many curious Observations to be made by the ingenious, who have turned their Thoughts to Affairs of this Nature.

But to consider what MILLER mentions, and take his lowest Estimate of ten Stems to one Corn, and twenty Corns in a Stem; that on the Supposition that only one Bushel of the Seed Barley grew, would be two Hundred Bushels for one, or twenty-five Quarters to an Acre; which is a Produce scarce to be much expected, however curious the Husbandry may be: though undoubtedly it may be much improved from what it now commonly is.

For if such great Produce be feasible, the Want of it must arise either from the not having good Seed, and the not ordering it well, or from the not giving it Compass of Ground enough to grow in; or from the Ground not being properly prepared for it.

The two former may be easily remedied, by common Care, with a very little or no additional Expence; and as to the proper Preparation of the Ground, that should be ordered in the best Manner, whether you sow your Corn thick or thin, in the common or in the Drill Way,

\* *Philos. Transact.* vol. 1V. 2d part, p. 310---311.



Way, or if you set it. And such good managing of the Ground can be no great Addition to what every good Farmer lays out in preparing his Ground for Barley, a Crown extraordinary would go a great Way, either in providing any steeping, or in bringing the Land to any Degree of Fineness, and indeed in both.

This Author mentions, That the Barley Corn which produced the most Grain was transplanted; and under the Head of Wheat I have mentioned several Advantages arising from that Method of Management, which I shall enlarge on farther hereafter; and the several Advantages that may arise to them thereby, which I apprehend may be in several Particulars equally applicable to Barley, and several other Species of Corn, and many Vegetables as well as to Turnips.

How far such a Procedure may improve the Grain or Vegetables transplanted is yet uncertain, but may very well deserve the Consideration of the Curious, and the trying it in various Particulars; for to name only the Improvements made in the now so much valued Asparagus, which is known to grow wild in the Meadows in some Parts of ENGLAND, and there is not eatable. It hath undoubtedly obtained its delicate Taste from the several Transplantations, and different Methods of Management it hath met with under the Gardener's Care. We are all sensible what Changes appear in Barley, when made into Malt, what Alterations are made in the Flour of Wheat by the Baker, when he improves it into Bread; and the Changes of Milk into Butter and Cheese, by the Methods used in making them, were they not so common would be Matters of great Surprise to us.

There are several Instances of very great Produce of Barley. PLATT's Friend plowed twenty Acres of Grass Ground, after crops plowed it, and harrowed it three or four Times to kill the Grass, and mingle the fat with the lean, and sowed it in the Beginning of MARCH, and had thirty Quarters per Acre, and sold it that Year at four Shillings per Quarter.

Sprat Barley has often produced ten or eleven Quarters when sowed in MARCH, tho' other Soils have produced but three or four.

To which I shall only add, that M. NUNN, in the County of ESSEX, had the last Year a large Field of Barley, which together produced eight Quarters per Acre. This is certainly very good yield, and what Land proper for Barley, with good Management, may reasonably be thought to produce in Quantities, in a good Course of Husbandry.

#### OF RYE.

Rye has been generally thought the next best Bread Corn to Wheat, and accordingly was formerly very much used for that Purpose, and is so still in some Places; sometimes alone, but then it has a peculiar Sweetness, which is generally disagreeable to those who are not used to it, and subjects many to Cholicks and Loosenesses, and the Bread made of it is black and heavy.

But a small Quantity of it was formerly, and still is in several Places, mixed with Wheat in the making of Bread, on Account of its keeping the Bread moist, and then is attended with no ill Consequences, but is rather thought to render the Wheat more tender, fresh, and agreeable to the Taste. And it was the more cultivated on Account of its being the Product of barren, gravelly, sandy Land, which was then thought capable of producing nothing else, or very little worth the Farmer's Care.

The common or Winter Rye requires a Summer's Fallow, and more Expence and Trouble in the Management of it, then it is found to answer well; since the great Improvements made of those dry sandy Soils proper for it, by the Advantages made of such Sort of Soils, by the sowing of Turnips, and several artificial Grasses, and the great Profit made by them; and from the several Species of Corn, they give the Farmer an Opportunity of raising much more advantageous than Rye: this must, on Course, sink it in the Husbandman's Esteem, and make it in general to be much less regarded.

There are two Sorts of Rye.

First, The common or Winter Rye.

Second, The lesser or Spring Rye.

The first Sort is what is usually propagated amongst us, and generally on such dry barren Land as is above-mentioned, where better Corn will not grow.

The second Sort, or small Rye, is to be sown in the Spring, about the same Time when Oats are. It is apt to run into Straw if it prove a wet Season, and this Sort is generally lighter than the other; however, it may be very conveniently used where Wheat or other Autumn Crops have miscarried.

Two Bushels are commonly allowed for Seed to an Acre, and four Loads generally reckoned a middling Crop; and it usually carries equal Price with Barley, and about one half of the Price of Wheat.

In several Places they sow Rye together with Wheat on the same Ground, and then it is called Maßen, that is, Miscellane; and will then bear a Price in Proportion to the Quantity of Wheat which is mixed with it.

The best Judges think this Sort of Husbandry to be a very ill one, since as the Rye is ripe before the Wheat, and must stand till they are cut together, the Consequence must necessarily be, that the Rye will shed a good deal of its Grain; and what is more, the Grains when so mixed seldom make a Bread that those Persons can well bear, who have been used to Wheat. But the Rye producing a Spirit, it is now said to be much used for that Purpose, and so far may save the Wheat; though I doubt such a Use of it will prove no great Advantage to our Country.

Rye is a quick Grower, and for that Reason the common Sort, as well as the other, sometimes is sowed in Spring, when Wheat miscarries, and has answered Expectation: and the smaller Rye (as before-mentioned) is very proper for this Purpose, as it is usually ripe at the common Times of Harvest. The common Sort is sometimes sowed so late, in order to be plowed in



in to fertilize the Ground for a better Species of Grain.

But there is a another more beneficial Prospect of sowing it in Autumn, which is, in order to provide Food for Ewes and Lambs in the Spring, when Turnips and Coleseed are gone, or have failed, and before any other Sorts of Grasses are grown to support them: and it may be sowed for this Purpose either on Land prepared particularly for this End, or on the Wheat Land after the Corn is carried off, or on other Stubbles when plowed up, or where Turnips have failed, and will probably answer Expectation, whichever Method of Management is taken with it for this Purpose.

It is certainly the best Proof of a Man's being a good Farmer, when he is known to provide proper and sufficient Food for his Cattle and Sheep for the whole Year in general, and also has a further particular View for a second Provision for his Ewes and Lambs, in case any of the former intended Sorts should miscarry.

All this he may certainly generally do, if he will but carefully consider the several respective Times. The common natural, and the several artificial Grasses, or Turnips, &c. will continue at the latter End of the Year; and also when he may expect any of them to come into his Assistance in the Spring: and then think of, and provide such other Supports for them in the Time. None of them are to be had in the usual Course of Things, by sowing either Turnips, Rye, or Coleseed, by the Help of one or other of which (with God's Blessing) he need not much fear but he may have a plentiful Provision for his Stock all the Year round. For which Purpose Turnips (I apprehend) may be made much more serviceable than is at present commonly imagined, as I shall endeavour to shew when I come to treat of Turnips in particular.

It is for the Want of this Knowledge and Care, to provide Greens and Grasses for their Sheep in the Winter and the Spring, that in many Places in the North they are obliged to prevent their Ewes from having Lambs, till they have natural Grass on the Ground, to help them to Milk to support them, which is often not till the End of APRIL, and sometimes not till the Beginning of MAY; and then they are obliged to eat their best mowing Grounds sometimes to the twentieth of MAY, before they can turn their Sheep to the Commons, and save their Grounds for Hay. If a dry Time then succeeds, these Grounds are burnt up, and their expected Product of Hay from their best Land, wholly, or in a great Measure destroyed; to the exceeding Disadvantage of the Farmers, and sometimes to their Ruin.

And why may not Rye be sowed for the Purposes above-mentioned amongst Turnips, and answer the Farmer's Expectation, especially as the Ground on which Turnips are commonly sowed, is generally better prepared, and usually of a better Nature, and in much better Heart than the Land commonly allotted for the Growth of Rye; especially where Turnips are sowed after the Drill Manner, or managed in the Method we shall after mention when we come to this Head.

In plentiful Years Rye may be given to Fowl, or Hogs, which last delight in it, and will feed very well on it, when ground, and made into a Paste, but then they should always have Water, and also a few Beans or Pease at the last, to harden their Fat, which is commonly very beneficial in most Methods of feeding them.

This Grain is very subject to grow in the Ear, if any Wet comes to it; and it will be soon damaged if any green Weeds are mixed with it, so that particular Care must be taken of it in both these Respects; both to let it have Time in the Field, to prevent the Weeds making it to give in the Barn, which will make the Corn musty, and therefore it should be housed dry, and that as soon as ever you can get it so.

The keeping it in the Chaff, on a dry Floor, is advised for the preserving it sweet after it is threshed; the dry Chaff imbibing any Moisture which may happen. This Method has been mentioned for preserving Wheat, and is useful in several other Grains.

#### Of the O A T.

The Oat is generally placed next after Barley, but is commonly esteemed of much less Value, and is accordingly much less regarded and husbanded; though, if we come coolly to consider the several good Qualities it has, and the Profit it produces, and those at how little comparative Expence, we shall find it equal to Barley in all Uses but one, and superior to it in many; and in Respect of the Expence and Trouble attending each, and the Profit they respectively produce, it will be found preferable to Barley, and perhaps to all other Grain except Wheat.

The Oat generally grows in all Countries, and almost in all Sorts of Land; but those Writers are very much mistaken, who, one after another, roundly affirm, that it will grow in poor Land as well as rich; indeed no Land can well be too rich for it, but whoever expects a good Crop of it from poor Land, will find himself sadly disappointed. There is one undoubted Proof of its doing well in rich Land, because it is generally first sown when the richest Fields and Meadows are first broke up (to take off what they call the Edge of the Soil) the Richness of which would make Wheat run too much into Straw.

How Oats will answer in a rich Soil, I experienced many Years since, on breaking up a rich Meadow of three Acres, inclined to moisture, on a gentle Descent, which, with one plowing, and no farther Trouble, it being a dry Summer, produced Stems in general between five and six Foot high, and some above, and very well headed. And though Oats were then cheap, these black ones were generally thought worth fifteen Pounds; and some Gentlemen brought in several of them above six Foot high, which were hung up many Years in the Hall as Curiosities. This was clayey Ground, and some Lime-stone lay above it.

In the same Neighbourhood black Oats were sowed seventeen Years successively, in an undivided Field, but was several Times manured, and brought tolerable good Crops to the last.

This



This was Lime-stone Land, and lay on a Descent, and I apprehend might receive some Advantage from the Lands above it, by the Wash descending from them.

The Oat is distinguished from other Corn, by the Grain growing in loose Panicles.

There are three principal Sorts of it.

1. The common, or manured White.
2. The black Oats: which are omitted in GERARD and PARKINSON, though in some Parts of ENGLAND they are more sowed than the former.
3. The naked Oat: much sowed in CORNWALL.

To these we may add two others; very considerable.

4. The red or brown Oats; and some, I suppose, reckon these the red and the gray, and all of them comprise the large white POLAND Oat, under the Name of White; the Seed of it being brought from POLAND, gave it that Name. And as it degenerates here in a few Years, it is often brought new from thence. It is apt to shed after Rain.

The white Oat has undoubtedly the larger Kernel, and turns out more Meal in the grinding than the black Oat; the Meal of a Bushel of the white being near three Pecks from the Miln, and that of the black but two Pecks; but then the white Oat requires richer Land, and will not bear Cold so well; and as to every other Article, but what they call the Yield, the black is equal to the white, if not superior in some Particulars.

For the black Oat, as above-mentioned, does not produce equal Quantity of Meal as the white does, Bushel for Bushel; but the Meal of the black Oat is as white, or whiter than the other, and is certainly sweeter. Notwithstanding what is said by two or three of our best modern Writers, the black is the most made into Bread, and the most eaten as such, both in the Northern and some of the Midland Counties of ENGLAND, of any Sort whatsoever; and is generally allowed to do less Injury to the Ground than the others; and, I presume, is much more generally cultivated in SCOTLAND, than either the common, white, or the POLAND Oat: nor does it need any Mixture of Wheat to make it wholesome or palatable when properly made. Nor does it delight most in morasses or fenny Ground, as Mr. LAWRENCE writes; since the Crop I had, as before-mentioned, was on very good Ground, sometimes eaten, sometimes mowed on a stiff Clay at less than a Foot deep, lying on a gentle Descent, and some little Lime-stone Land lying above it there are yearly vast Quantities of Acres of good black Oats got on Lime-stone Ground, which is well known to be very dry Land. But perhaps this mistaken Notion concerning black Oats, may arise on Account of their hardy Nature, and for that Reason their being frequently sown on such Ground, where it is commonly thought no other Grain will grow. The naked Oats, when threshed, will make Meal without going to the Miln, but it is not so good as the former Sorts.

### *The Uses of Oats.*

Oats being a very temperate mild Grain, are fit for almost all Manner of Uses and Purposes any Sorts of Corn can be, and being an hardy Grain it will grow in almost any Soil, and that with the least Culture of any Grain whatsoever being very prolific will, all Things considered, be found the most profitable of any Grain whatsoever (except Wheat) which some think is not much inferior to in this Particular; and may, in one Sense, be said to be an Improver of Land, as it paves the Way for its producing other Sorts of Grain.

It is commonly known and observed, what great Fatigues and Labours the SCOTCH have frequently gone through, when supported only by a small Quantity of Oatmeal, which is a manifest Proof of the Goodness and Spirit of that Grain that could enable Men to go through such Toils and Labours; and it is very well known that the most of the Northern Peasants have little else to support them in their hard Labours, particularly in that of getting of Stone; in which Work I have known them to sweat Day after Day, with no other Nourishment but Oat Cake (Bread) and Water; and the better of them with only an Addition of a little Butter and Cheese, and a little Whey or Buttermilk to drink, seldom tasting Flesh Meat or any Malt Liquor whatsoever.

Oats, when malted, make a very pleasant Ale, and are frequently used for that Purpose: and they are used in the Kitchen in a thousand Particulars, in which the Flour is preferred to the Flour of all other Grains; and there is no Pretence to set up any other as equal to it, except Wheat, which to be sure is to be preferred before it in many Cases.

It is also exceeding proper for the feeding of all Sorts of Fowls, and Swine of all Sorts, making the sweetest Bacon of all Feeds; though it is thought very advisable to give the Swine a few Pease, toward the End of their feeding, in order to harden their Fat.

The Excellency of Oats, as the best and most wholesome Food for Horses, is allowed by all; and that when they have been kept till they are thoroughly dry, there is no Danger of those Distempers which commonly attend, and are frequently fatal to those fed on Beans.

They are equally useful for the feeding the Cow or the Ewe, to help them to Milk, and to nourish their Young; and at the same Time will support the Ox in his Labour, or feed him fat the Slaughter. And the Straw is valuable for Food for Beasts, beyond that of all Grain, and when some of the lightest Oats are left in it, and only the best threshed out (which is called batting) it is thought very good Food for Beasts; and Packs of Hounds, and all other Dogs, are commonly fed with Oats, when ground down.

### *Of the Soils proper for Oats.*

As to the Soils, it has been mentioned that they will grow on all, and do very well on most, where a Crop of Corn can be reasonably expected; yet Oats certainly do best on the best Ground,



Ground; for which we may appeal to common Experience, when they are sown at the first breaking up good Ground, or when the Ground is well manured for them, which is common in the North; and in the Instances before, and which will be mentioned hereafter, also fully confirm the Truth of this.

Oats will do with the worst Tilths, in the poorest Ground of any Grain, and very seldom have that Culture they well deserve, and will answer for, in their Produce: dry Ground will agree with them as well as wet, as is abundantly manifest by the great Quantity of Oats got upon Lime-stone Ground: and the great Produce arising thence, some Instances of which are herein mentioned scarce to be exceeded in any other Place, and far beyond the Crops mentioned by our late Writers as the common Product of Oats. I have had very good Crops of them after Turnips eaten on the Land, without any other Manure, the Produce being from six to eight Quarters an Acre.

*Of Seed Oats, and the changing them.*

The Seed usually allowed for an Acre is four Bushels; but in several Places, they sow six or more, where the Ground is poor, or where such an ill Custom has prevailed. In this Article of Seed, the Farmer ought to be careful in getting what is good, and changing it from different Sorts of Soils, as in any Kind of Grain whatsoever, since he will find it equally beneficial. It is seldom that Oats are steeped, nor do they seem to want it as to their certain growing: and as to any other Advantages that may accrue to them by steeping, the Reader will find them mentioned under the Head of Steeping, and the Practice of it must be left to his own Discretion.

There is a Saying mentioned, That a quick Man should sow Oats, and a slow Man Barley; because Oats need not be sown so thick as Barley, but according to the Quantity of Seed allowed to each; this is no certain Direction.

Formerly they used not to sow Oats till MARCH, but of late Years they commonly plow for them at the Beginning of FEBRUARY, and sow and harrow them in from the Middle of FEBRUARY, and so on; and now apply to them in this Particular, the Saying, The sooner in the Ground the sooner out; and find by Experience, that their Crops are generally ripe sooner than they formerly were when sowed later. And as this is their principal, if not only Grain in many Places; they generally weed it carefully, but have not had the beneficial Custom of Rolling it long practised amongst them in the North; nor has it yet generally prevailed, though now found so advantageous to it.

*Of Reaping.*

In regard to the reaping of Oats, the North far exceed the South Country Farmers, since they generally shear their Oats as carefully, and as clean from Weeds as the nicest Farmers do their Wheat; and some of them bind the Sheaves as they shear them: but others more prudently leave them open all the

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Day, by which the Middle of the Sheaf gets very dry; and then they bind them up, and set them in Shocks, ten or twelve in a Shock, as the Farmer pleases; two called hooders, being gently drawn over the Tops of, and covering the others, &c. they will stand thus many Days without any Damage; and in Case of any very severe Weather, will, on a dry Day, be fit to load so, that if the Farmer have but Patience, it is very seldom that Oats suffer in the Field; and if they be led moist, they suffer less in the Barn on that Account than any Grain whatsoever, both in Respect of the Nature of the Oat, and of the Straw. The usual Price of Sheering is about Three Half-pence per Thrave, and the North Countrymen are very dextrous at this; and when they come into the South to work, as many of them do in Harvest, excel the South Countrymen in the Article of Sheering.

If the sowing be deferred long, as it sometimes is till APRIL, then it should be well harrowed in; and in some Places the Wetness of the Land almost obliges the Farmer to the sowing so late.

*Of the Produce, and other Advantages of Oats.*

MILLER mentions Oats as a very profitable Grain, and that the usual Produce is five and twenty Bushels; though he has sometimes known more than thirty on an Acre. This is a very poor Account of the Produce of this Grain, since four Quarters are common on very indifferent Ground; and six or seven is no extraordinary Crop; and ten Quarters are frequently had with only one Plowing without any further Trouble.

I am certain I had an Hundred Bushels or above of black Oats on an Acre, as before mentioned, with only once Plowing, and that without any Rolling or Manuring whatsoever; and it is very common to have forty or fifty Thraves on an Acre; each Thrave consisting of four and twenty Sheaves, and each Thrave, if the Oats be good, and the Sheaves of the usual Size yielding from one Bushel three Pecks, to two Bushels one Peck: so that an Hundred Bushels on an Acre is nothing extraordinary, both in DERBYSHIRE and STAFFORDSHIRE on good Land. And I have known an experienced Farmer in STAFFORDSHIRE had three Hundred Thrave of good black Oats on five Acres on good dry Lime-stone Ground, with only common Husbandry, and once Plowing (as he told me himself.) This was thought a very good Crop, but not such a one as to occasion any Amazement, seven, eight and ten Quarters being very common. To which I shall add one Instance more; which, tho' nothing extraordinary to me, will appear so to those who think four Quarters of Oats a good Crop.

The Instance I shall last mention is, that of a Crop of Oats of a pretty large Field of a Farmer in the Isle of MERSEY in ESSEX; which the last Year brought him eight Quarters and an Half of Oats an Acre through the whole Field.

This Crop followed one of Wheat, and he managed his Land after the following Manner:



It being a very dry Time after Wheat Harvest, he set Fire to the Stubble, and burnt it off very clean; after gave the Field three clean Tilths, and laid it on a round Ridge (as they call it) all the Winter, and then sowed it as usual with Oats in the Spring, and had the Produce above mentioned.

The three Plowings may be thought an extraordinary Expence (and indeed is very unusual for Oats) but where the Ground is kept in a good Course of Tillage; and a Man with two Horses can plow two Acres; or at least an Acre and an Half a Day, the Expence is nothing extraordinary. An Acre not engaging such a Team above two Days at the most for three Plowings; and a considerable Benefit to the ensuing Crop may be reasonably expected, as well as the keeping the Land sweet and clean from Weeds, is the great future Advantage that will be to the Land in the succeeding Crops of whatever Kind they be.

Another Writer says, "Most People sow Oats for two Reasons, one because they lower the Strength of new Ground, and the other to give old Ground the Benefit of Change of Seed;" and yet this same Person allows five Quarters on an Acre as a common Crop, and says, "He has known nine, and that they have often ten Quarters an Acre, when they Manure the Ground for Oats;" so that by his own Confession and Reasoning, a common Crop of Oats far exceeds a common Crop of Barley. And where the Land has the same Manuring for Oats which Barley requires, it hath the Crop of Oats double to that of Barley; and, consequently, is preferable to Barley, for the bare Profit they will respectively bring to the Farmer, the Prices of the one and the other not being usually much different. But this Preference of Oats will appear more, after we have considered the Advantages of Oats, which have by several been on the whole frequently estimated equal to the general Produce of a Crop of Wheat.

#### *The Advantages of Oats.*

There are three very considerable Advantages the Oat claims, which no other of the white Corns do; nor, indeed, any other Sort of Grain common amongst us, has any Pretence to vie with it in, with the least Appearance of Reason.

The first is, that it will grow and pay frequently very well on those Lands, which will not answer to the Sowing any other Sort of Grain: and this Advantage is generally allowed the Oat by all who write on this Subject; which they have rather carried to an Excess in its Behalf, when they say, It will grow in all Countries, and on all Lands; that there is no Ground too rich, or too poor for it; which cannot be said of any other Grain whatsoever. So that in this Respect Oats have undoubtedly the Advantage above all other Grain whatsoever.

The next Advantage of the Oat is, That it is pretty certain to bring a very good Crop, on the first breaking up any good Meadow or

Pasture Ground; of which we have given some Instances before, and might easily add numerous others: but this Advantage is also generally allowed to the Oat, that it in this Case commonly produces a very good Crop, without any Manner of Expence but of one Plowing and Sowing. And also prepares the same Ground much better than it could be any other Way for a succeeding good Crop of Wheat, which is so eagerly sought for in all the Corn Countries.

The third particular Advantage of the Oat is, The Benefit arising from the Goodness of the Straw for Food for Cattle; for which Use it is usually sold in our North Countries, from Fourpence to Sixpence a Thrave; and, consequently, tolerable good Crops may on a Medium be valued at twenty Shillings per Acre, in which no other Straw can be compared to it as to the Sweetness of it for Food; nor indeed is there any other Straw but Wheat of any Value to speak of. And though Wheat Straw excels it for Thatch, yet Oats will last several Years for that Use; and, on the Whole, may justly have its Straw reckoned amongst the Excellencies belonging to the Oat.

There is another Advantage it certainly has over the two most esteemed Sorts of Grain, Wheat and Barley, which is, That it is got with less Plowing, requires not so fine a Tilth, and not near so much Manuring in general, as they do to procure an equal respective proportionable good Crop; all which will be saved in the Farmers Out-goings, and will enter into every wise Man's Consideration. It is not subject to Smut, so prejudicial to Wheat, and suffers the least in a wet Season of all Grain, being as soon dry as any, and suffering the least when housed wet.

And as to the general Advantages of other Grains, it may be said to stand at least with them on a level; for, it gives the Farmer an Opportunity of varying his Grain, which is one of the general Advantages of Husbandry; and, particularly in what is called the new Husbandry. It seems not to dislike the following any other Grain; and to answer any Husbandry which the Situation of the Ground, as to its Goodness, will afford it.

It also allows a long Time after other Crops are got off the Ground, for the meliorating the Land, by the Benefit of its lying exposed in Fallows, and to Winter Frosts, before it is necessary to sow it: the Advantages of which are very well known.

Lastly, It is superior to all other Grain but Barley in its Capacity of receiving the foreign Grasses to be sowed with it, from which a great Part of the Advantage of all the new Husbandry particularly depends, of which we spoke before under the Head of Barley, and therefore shall not repeat it here, but shall only say, The Oats has a Right to every Thing said advantageous of Barley in that Respect.

A late Writer gives the Oat the Preference to Barley in this Point, in the following Words: "An Oat Crop is the properest Corn of all others, to sow any of the Grass Seeds amongst, if the Ground is in Heart, because

" the



“ the Stalks of Oats are apt to stand stiffer than Barley, and thereby the Crop of Grass is in less Danger of being spoiled.”

This Author justly observes, “ If the Ground is in Heart,” since the Land set apart for Oats is very seldom so well manured for Oats, when the Grass Seeds are to be sown in it, as it is for Barley; and, consequently, a less valuable Crop of the Grasses is to be expected when the Land is in a poorer Condition: but the right Way of judging is, when they are in the same equal Condition of Goodness; and then to see, which would answer the best. But even in this Case I would not insist on its Superiority to Barley in this Particular, but only say it is equal to it: for the Oat has other sufficient Advantages above the Barley, as may appear from what is before mentioned here, and above of its Uses, and from what will be seen in the following Calculation.

*A Calculation of the Profits of Oats.*

In this Calculation I shall not take the Produce of a Crop of Oats at nine or ten Quarters, which frequently happen; but at six Quarters, which may generally be reckoned a good Crop.

Estimating the Value of a Bushel of Oats at one sixth Part less than the Value of Barley, the Oats will then be to be reckoned at twenty-pence the Bushel; which being thirteen Shillings and four-pence per Quarter, six Quarters will amount to just four Pounds for the Produce of the Oat; and the Straw will above answer the Sheering, Loading, Threshing and Cleaning. The other Out-goings will generally stand thus: Seed four Bushels, six and eight-pence; Plowing, Sowing, Harrowing, and Rolling, six Shillings and eight-pence: Rent reckoned as the Barley, eight Shillings. And though Oats have very seldom any Manure laid on the Land in particular for them; yet, in this Case, I will allow ten Shillings and eight-pence for Manure. So that the Out-goings will be in the whole, all Expences and Trouble allowed for, one Pound twelve Shillings; which, deducted from four Pounds, the Produce of the Crop of Oats, there will remain two Pounds eight Shillings clear Profit to the Farmer. Whereas the clear Profit of Barley, all Out-goings allowed for, amounted to about eight Shillings. So that this Way there is two Pounds Difference. And if Oats are sometimes less, so is Barley frequently: and if Barley sometimes exceeds four Quarters, Oats much oftener exceed six Quarters. So that on the whole, the Oat seems to have a clear Right of Preference to the Barley, as to the Profit accruing to the Farmer from them respectively: and, on an Average, the Oat will be found to produce twelve or more for one; and few other Sorts of Grain can pretend to do more.

In this Calculation of the Profit, I reckon on the white Oat.

Most of our Writers, (though many of them Persons of very good Understanding) insinuate the great Advantage of Oats to be,

that they would grow in the North, where nothing else would; and even including in that some of our very Midland Counties, as DERBYSHIRE and STAFFORDSHIRE. It may not be amiss to consider this Matter, that the Farmer may not be discouraged from attempting to raise good Corn, Fruit and Vegetables, in whatever Part Providence has placed him; provided he act with Prudence, and engage not too deep at once in any Trials of this Kind.

It was long before it was known, that a Cherry would grow in ITALY, or a Grape in FRANCE; much less either of them in BRITAIN. And the great Sir WILLIAM TEMPLE, who lived within Memory, was strongly of Opinion, that no better Wall Fruit than a Plumb would grow beyond NORTHAMPTON, though the contrary is now well known to the Nation.

To come from Generals to Particulars, which strike the deepest. It is not many Years since, in the Parish of ASHEOVER, near CHESTERFIELD, in the County of DERBY, no Wheat was got, though it is now in great Plenty; and all owing (as I have been credibly informed) to a Woman married from a Corn Country, who persuaded her Husband to try, as there was Lime enough for Wheat; which proving successful, encouraged others, and has spread all around.

Another Instance fell within my Observation, for going once directly from CHESHIRE to LONDON, I saw Barley cut and in the Shock, between WINNINGTON BRIDGE and NORTHWYCH; and no other Corn of any Sort cut in all the Way to LONDON, though I took particular Notice.

To which I shall only add from Mr. HAMILTON, who resided ten Years in ENGLAND, and made it his Business to inform himself in Husbandry. “ They there had as good and as large Carrots, Cabbage, and Parsnips, as ever he saw in ENGLAND.”

But having paved the Way for a favourable Hearing by these Instances, this being a Matter of almost general Concern, I shall here take the Liberty to enlarge a little on this Point.

Corn, Vegetables, &c. principally owe their Excellence to the Nature of the Soil, the Goodness of the Air, a proper Situation, Shelter, and a kindly suitable Heat: all but the last are undoubtedly to be had in all Parts of the Kingdom, as well as near LONDON; as might be easily proved in particular. And in order to set the Point of Warmth in a proper Light, I will give the Tables of the different Quantities of Heat, at different Parts of the Kingdom, as they have been calculated by those who are thought well versed in Affairs of that Nature; and will after make some Observations on this Subject.

Tables of the Quantity of the Sun's Heat at Noon, when it is vertical at the Summer Solstice, the two Equinoxes, and the Sun's Entrance into Taurus and Virgo, for the several Latitudes from  $44^{\circ}$  to  $56^{\circ}$ .



In these I shall mention only those we are concerned in, beginning at the Lizard Point, and ending at EDINBURGH.

| Degrees of Latitude | Names of Places.               | Heat, June 10. | Heat, Aug. 10. and Aug. 12. | Heat, March 10. Sept. 11. |
|---------------------|--------------------------------|----------------|-----------------------------|---------------------------|
| Vert. Sun           | _____                          | 100            | 100                         | 100                       |
| 50                  | The Lizard                     | 71             | 49                          | 26                        |
| 51                  | _____                          | 69             | 47                          | 24                        |
| 51½                 | LONDON                         | 68             | 46                          | 23½                       |
| 52                  | _____                          | 67             | 45                          | 23                        |
| 52½                 | YELVERTON, in NORTHAMPTONSHIRE | 66             | 44                          | 22½                       |
| 53                  | _____                          | 65             | 43                          | 22                        |
| 53½                 | LINCOLN                        | 64             | 42                          | 21                        |
| 54                  | _____                          | 63             | 41                          | 20                        |
| 55                  | NEWCASTLE                      | 62             | 38                          | 19                        |
| 56                  | EDINBURGH                      | 60             | 37                          | 18                        |

The Gentleman who procured these Tables and Calculations, very justly observes, that tho' they shew the real Difference of the Sun's Meridian Heat, in different Latitudes, yet they do not account for the greater Number of Hours of the Sun being above the Horizon, which a Northern Latitude has more than a Southern one; which is the principal Thing as to our present Purpose.

And therefore he assures the Reader, in general, and by one round Number, That during all the Summer Season (the Time of ripening Fruits) betwixt the two Equinoxes, there are no less than one Hundred Hours of Sunshine at DURHAM, more than there are at PLYMOUTH; as might easily be shewn by a particular Table.

There are several other Particulars which, under this Head, may be taken into Consideration, in Behalf of those who live Northward, which may set them on the Level with, or give them a Superiority over some of the more Southern Countries; besides what this Author mentions of the greater Number of Hours of Sunshine they enjoy, more than these as above-mentioned.

As first, the different very good Sorts of Soil frequently found in the Northern Counties, which all allow to be a considerable Article in this Point, when compared with several other Sorts of Soil in the South.

Another Advantage is, that in several of the hilly Countries, which are the most subject to be contemned, there are frequent Vallies so well guarded by the Hills, from all Manner of unkindly Winds and Storms; and of so good a Soil by Nature, and the Produce of which is so promoted by the Reflection of the Sun's Heat, by the Position of the Hills, that they are as forward as any Places in the South; and allowing them the same Culture, would have as early and much sweeter Produce than the Ground near LONDON would with the same Management, and would produce all Sorts of Vegetables, and most Sorts of curious Fruits, equal to those in the Southern Countries.

I could name several particular Places which would answer what is above-mentioned, but shall rather take Notice of those more generally known.

CHATSWORTH in DERBYSHIRE; the Seat of his Grace the Duke of DEVONSHIRE; though far from being a kindly Situation, or placed on a good Soil, is managed so as to produce most Things near equal in Goodness to those in the South.

And HADDON, two Miles from it, the ancient Seat of the Duke of RUTLAND's Family, is on a better (Lime-stone Soil) and before it was neglected, and indeed destroyed, produced as good Vegetables and Fruit, as then were found in most Parts of the Kingdom. And still, though only under a common Gardener's Care, it produces admirable Vegetables and Fruits, which many Years were sent to BUXTON or CHATSWORTH. But of late Years BUXTON, which was always thought to be placed in as barren a Place, and as unkind a Situation as could well be imagined, and which, within my Memory, used to fetch Greens and Vegetables for twenty Miles round, to furnish the Guests with what was proper for them; even this barren Place is now so managed, as to produce every thing necessary and useful, and many Things curious for the numerous Guests who resort to it.

Now these Instances, with what was before-mentioned, will undoubtedly shew that the Northern Countries are capable of producing the Grains and Vegetables which some would appropriate only to the South.

The whole Earth is reckoned naturally barren, as to the Production of Corn; and clayey Land, which was usually esteemed the most unkind of all Soils, by proper Culture, is brought to produce the best Wheat, the best of all Grains.

A Reverend Gentleman, who made this Point his peculiar Concern declares, that after living in the Middle or Southern Parts of ENGLAND, the first Part of his Life, on his Removal into the Bishoprick of DURHAM, he never eat more or better Fruit, even of the later Kind (except Grapes) than after he came into that Bishoprick; and thinks a Degree or two will have little Influence as to Fruit, in Comparison of the Soil and Situation; and that, was there as good Markers in the North as at LONDON, all the curious Things so much admired at LONDON, would be equally raised there. And the Argument is much stronger for the well raising of Corn and Vegetables, than for the raising curious Fruits.

So that on the whole it appears, that the greatest and most considerable Difference of Heat and Warmth, for ripening Fruit, Corn, or other Vegetables, arises principally from the Nature and Circumstances of Soil and Situation, from a Place lying on the South or North Side of a Hill, from its being on the Top of a cold Hill or in a Vale; from its being sheltered or not sheltered from Winds; from its lying on a cold Clay, or on a warm Sand or Gravel. These are the Circumstances chiefly to be regarded.

For it is very plain that a Garden, or Land lying on an easy Slope on the South Side of an Hill, receives more of the Sun's Rays than the same Quantity of Ground lying on a Plain, and hath more real Advantage of Heat from the Sun, than several Degrees of Southern Latitude would give it, *ceteris paribus*. And the Argument



ment is stronger still, if the Ground in the South slope to the North; the same Thing is to be said with Respect to cold Clays, and warm Gravels, they being guarded or not guarded from Winds and so on.

As to the Inconveniencies which are common to the whole Island, such as the Inequalities of our Seasons, the Violence of our Winds, and the sudden Changes of our Weather, they cannot be said to be more prejudicial to the North than the South; but on the contrary, according to Dr. DERHAM's History of our great Frost, the South suffered then much more than the North, as he and other Observers mention, of which they give numerous particular Instances.

These Observations may not only serve to reconcile the Farmer and others to a Northern Situation, but also encourage them to equal Industry and Application, with those who are situated more in the South; since they find, that if they act with equal Judgment, they need not fear but they will meet with equal Success.

Hence also they may draw many useful Observations, as to the Manner of ordering their Grain and their Roots, from the several Advantages they may reap from the different Natures of their Soils, and the different Position of their Grounds, as to North and South, and the proper Shelter they may severally enjoy, or which may be provided for them; it being commonly observed by Farmers, that the one Side of a Corn Land, in many Situations, is much thinner of Corn than the other. And the same may be said of Fruits, and may be applied in numerous other Instances.

To return to Oats, there is one other Thing I shall observe relating to them, which is, about the Manner of keeping them.

#### *Of keeping of Oats.*

The Oat has one farther Advantage, that it may be kept the securest and in the easiest Manner of most Sorts of Grain, if not of all Kinds whatsoever.

It was observed before, how little subject it is to receive Damage when housed in the Barn, or placed in a Stack, on Account of the Nature of the Straw, which is both sweet and dry, and the least subject to be musty of any Sort.

Oats will also keep very well when threshed, and laid by in the Chaff, without any further Trouble or Care, provided they be not laid by wet, or wet be permitted to come to them, in such a Degree as would spoil any other Corn whatsoever.

But the principal Method of securing the Product of this Grain, where it is used as Bread, is by first grinding it, and making it into Meal, and then putting it close down in an Ark of Wood, where it will keep good many Years. This Method is so well known in the Countries where the Meal is generally used for Bread, that there is scarce a Family but has one of these Arks kept under Lock and Key, either in the Dwelling House, or in some Building adjoining to it, or in their Barns. In which those who are able keep a sufficient Stock for their Families, from Time to Time; and those who can keep it for a rising Market, oft sell it at the same pro-

portionable Profit as those do who can save Wheat till it rises. It is very common to put four Hundred Pecks of Meal into one of these Arks.

#### *Of the BEAN.*

The Bean was well known to, and much esteemed by the Antients; but Mr. RAY observes it is disputed amongst the Botanists, whether their Bean was the same which is now usually sowed with us; since it is very certain, from many Places both of THEOPHRASTUS and Dioscorides, that the Bean of the Antients was small and round.

Yet, as he observes on the other Side, it seems incredible, that a Pulse so common, and of such daily Use, should be utterly disused, or change its Name, and have another substituted in its Place, without any one taking Notice of it.

But if a Conjecture may be allowed in this Case, the Bean of the Antients, as described by Mr. RAY to be small and round, and which was formerly so much eaten, seems more like what is now called the Magazan Bean, after-mentioned, than that we most commonly sow. And as to the Use of its being lost, or the Name being changed without any particular Notice taken of it, so many Things of that Kind have happened, in the Succession of Ages, that it cannot occasion much Wonder.

#### *Of the Sorts of Beans.*

These are principally two.

The less or common Field Beans, or Horse Beans, generally sowed in the Fields. And

The great Garden Beans of various Sorts and Colours, for the most Part white, but sometimes red.

PYTHAGORAS forbade his Disciples meddling with Beans; what he meant by this was, that they should abstain from meddling with the Affairs of the Republick; because the Antients used Beans in the electing their Magistrates as Distinctions when they voted.

The Bean has a papilionaceous Flower, which is followed by a long Pod, filled with large Seeds, the Stalks are firm and hollow, and the Leaves grow by Pairs, and are fastened to a middle Rib.

The common Farmers seldom sow any but the small or Horse Beans in the open Fields: but as many of those called Garden Beans are now much cultivated in the Fields, both near LONDON, and in several other Places, and are equally capable of being managed after that Manner, and that with greater Advantage to the Owner, the one as well as the other, deserves a Place in such a general Undertaking as this, for the Farmer's Interest, whose Advantage ought to be particularly regarded in every Point. If it be rightly considered, in reality, a Garden is but a little Field well cultivated, and what we call a Field, but a great Garden capable of all the same Methods of Management. Which large Field, managed with the same proportionable Industry, Manure, and Care, will produce a proportionable Profit, both in the Case of Beans, and also of all Sorts of Vegetables, as will evidently appear to any Person who will but walk into the

Fields



Fields about CHELSEA, FULHAM, BATTERSEA, and so on.

The principal Varieties cultivated are these :

1. The common Field Bean ; the Culture of which will be treated of hereafter.

2. The early Lisbon, or Portugal Bean ; which is the Sort most commonly sowed by the Gardeners, one of the earliest ripe, and principally valuable on that Account ; being, in Reality, a coarse Sort of Bean. It is often sown in OCTOBER or NOVEMBER, and does not require so much Sun, as a proper Shelter ; which tall Hedges or Trees, when properly placed on the East, North, or West afford. For it is now well known to the Curious, that both Grain and Vegetables suffer most in the hard Seasons, when they are exposed to the being sometimes frozen or covered with Snows, and then thawed or uncovered ; which prove the most destructive to what is early of any Weather whatsoever.

DERHAM observes, " That Snow preserves " Bodies thirty Years uncorrupted, and guards " the Corn against cold piercing Winds,\* and in his History of the great Frost,† he observed, " That many small Fields of Wheat escaped " pretty well, where fenced with thick high " Hedges against the cold Winds ; especially " where they were covered long with Snow. " Those suffered more where the Winds blew " off the Snow ; and those were the best Wheat " which were on such Pieces as lay on gentle " Descents, facing the West or South West ; " especially when guarded on the East Side " with a Hill, or a Wood, which fenced off " the cold piercing Easterly, and North Easterly " Winds."

Several other curious Persons confirm the same, and observe, " That Easterly Winds do " more Mischief sometimes in Spring after a " few favourable Days, than all the Winter " Frosts ; since by sudden Changes of the " Weather, the Passages in Trees and Plants " are stopped ; the crude Sap setting, becomes " a Disease in Trees equal to that of Chilblanes " in Juvenile Blood, which sometimes takes " whole Trees, and sometimes Branches only. || Now this being a Matter of Consequence, and applicable to so many Cases, I thought it might properly be inserted here once for all ; both for the Sake of the Farmer in the Field, and every private Person in their respective Gardens. We doubt not but they will take the Advantage of this Remark, by being careful where they sow any Thing curious, or intended to be early. And also to be very cautious not to trust to a few flattering Days in the Spring, but to wait in nicer Things till the Mulberry puts forth its Leaves before they expose them.

It was very common to plant early Beans, and Things of that Kind under Walls, that they might have the Benefit of the Sun ; but the Reasons above, and modern Experience, may instruct, that those Situations are frequently fatal, and therefore most now rather chuse to set them against Hedges, or Reed Hedges run along the Garden for that Purpose. And yet with the greatest Care, and the desired Success, they will only be found about a Week or

ten Days earlier than those set in the Spring, and are not to be esteemed of the best Kinds.

The small Spanish Bean comes in quickly after the Lisbon Bean, and is a sweeter, and will consequently be preferred to the other.

The broad Spanish Bean is a good Bearer, and coming in before the common Sorts, is valuable upon that Account.

The Sandwich Bean succeeds soon after the Spanish, and is almost as big as the Windsor ; is a plentiful Bearer, and a hardy Bean ; and consequently may be sown much sooner by a Month.

The Toker Bean is a great Bearer, and comes in about the same Time with the Windsor.

The Blossom Beans black and white, are very green when boiled, and very sweet ; but the Seed is subject to degenerate.

The Windsor Bean is undoubtedly the best of all for the Table ; and, when gathered young, is the sweetest and best tasted of all ; and when they have Room, and a good Soil, they are plentiful Bearers, and very large.

These are seldom planted till CHRISTMAS, because they bear not the Frosts so well as some of the others, so they generally come in JUNE and JULY in Abundance.

The Mazagan Bean is esteemed the first and best Sort of early Beans now known. The Seeds are much smaller than those of the Horse Bean ; and, consequently, seem more agreeable to the Sort mentioned by the Antients.

If these are sown in OCTOBER under a warm Hedge, Pale, and so on, and earthed up as they rise, they will be ready in MAY, and bear plentifully.

These Seeds were brought from the Coasts of AFRICA by the PORTUGUESE, and from them to us, and brought hither as wanted. When the Seed is sowed here they grow larger, but ripen not so soon.

These several Sorts differ pretty much in Shape, require different Times of Setting, and vary in the Time of their Ripening, as well as in their several Tastes : and also in their Qualities of bearing the hard Weather better or worse. Notwithstanding all which, the best Writers are of Opinion, that they are only seminal Variations, and that they are very subject to degenerate. For which Reason great Care ought to be taken of procuring proper Seeds ; for I once had a Sort of Bean between the Lisbon and Windsor Bean, which was as early, hardy, and near of the Size of the Lisbon Bean, without the Coarseness of the Taste of it, in which it very much resembled the Delicacy of the Windsor Bean : but miscarrying in preserving the Seed of it as good, and the Friend I had it from being in the same Situation, I never since could retrieve it.

Beans when about two Inches high, should be carefully earthed up, and so as they rise two or three Times ; and, in very severe Weather, should be covered with Fern, Peasehulm, or some light Covering, but to be taken off in mild Weather.

These planting of Beans may be repeated once in three Weeks, and the less Care is necessary as they come later, and the less Seed. The setting

\* *Physico  
Theol.*  
page 34.  
† *Philos.  
Transact.*  
vol. IV.  
page 122.

|| Vol. II.  
page 158.  
754.



ting them at the greater Distance will do as they are set later. The Windsor Beans may be set in Rows at a Yard Distance, and at three Inches in the Rows, or rather farther off.

The after Crops should be planted about a Fortnight-Distance after each other, from FEBRUARY to the Middle of MAY, kept clear from Weeds, and 'tis well to keep earthing them up; and when they are in blossom to cut off the Tops of all, which will help to increase the Pods, and also to destroy those Flies so pernicious to them: the later the Beans are sown, the moister Ground they require; and it is proper to take off the Suckers, when the Beans are about a Foot high.

This may seem unnecessary for the Farmer, but as several of these Beans are already got into the Field, and others gradually following them, we hope the Reader will receive this Account of them favourably.

*Of the Seed, Sowing, and Steeping.*

You should take Care in the Choice of Seeds, particularly when brought from distant Places, or when had from Strangers, since the Crop must miscarry if the Seed be bad; and where it is but indifferent, the greater Quantity must be used to answer for Accidents. And this Care is necessary and applicable in almost all Cases, but being of the greatest Consequence, the mentioning it cannot be too often repeated.

There may be said to be four Ways of sowing, or planting of Beans.

The old Way of sowing them in the Field was generally to plow the Ground, and let it lie some Time: then to sow them in the broad Cast-way, and harrow them in, which was seldom found to answer well; the Seed being too much exposed to be eaten by Fowls, or burnt up in Summer by the Heat, for want of a proper Depth of Earth.

But of late they have generally sowed the Beans under Furrow, by plowing them in with as thin a Cast as possible; and, in very stiff Lands, they harrow the Ground after a Shower, when the Beans begin to peep, which helps to break the Clods, and let out the Tops. But great Care should be taken not to plow too deep, for fear of burying the Seed; and to lay the Turf flat, not edge-ways, that the Beans may be covered with Mould; since if they lie hollow, they will be subject to grow mouldy and decay.

The second Way is by the Drill Plow, of which Sort of Husbandry the Beans are sometimes capable; though a very stiff Soil, and the Make of the Bean does not suit it well. When we come to treat of Pease, we shall make some Remarks, what Objections are to be made to it, and how far it has prevailed.

The third Method is the setting the Beans by Hand, in Rows, in Holes, at about three Inches Distance. When the Ground is properly prepared, which the Women will do in many Places for Three-pence the Peck. This is a very moderate Expence; and will be saved in the Seed Beans used this Way, in Comparison of what are used in the common Method of Sowing. But in this Way I should prefer the

making the Holes with a Trowel, rather than a Dibber; which, though it gives a little more Trouble to do it, yet it prevents the Beans from laying hollow; and also leaves the Mould looser about them, and so they will be better able to strike freely into the Ground. It comes nearest the sowing in Drills made by the Hand Hoe, or by the common Plow; which may be reckoned, The fourth and last Way, both these are used by the Gardeners, who are very expert at the Hand Hoe, and will dispatch a great deal in a short Time, and plant the Rows at any desired Distances, either to have the Interstices left open for other Vegetables to grow betwixt them, or for the Beans to spread. As for the hoeing them after by the Hand or Dutch Hoe, or by the late Contrivance of running a small Plow betwixt the Rows, as was before mentioned under the Head of Wheat; or, lastly, for letting Sheep into the Beans in the Fields to eat the Weeds, which they will do at proper Times without prejudicing the Beans.

This Method of sowing or planting the Beans, seems to have every Advantage that can be obtained both in respect of the Depth and Distance they are to be placed at; and also in regard to their being inclosed by mellow Soil, into which they may freely strike every Way.

In Ground properly managed, the common Plow may be ordered to answer most of the Ends last mentioned, and is much used for those Purposes; and, I presume, the Method of sowing by the Hand along with the Plow, as mentioned under the Head of Wheat, may be equally useful in the ordering the Beans. And the Gardeners are said to love the Plow in this, as well as some other Cases.

As to steeping of Beans it is not very commonly used for those sowed in the Fields, the Season they are sowed in being commonly wet, and consequently there being no Occasion for it, on Account of their being made to vegetate; but the Bean will bear steeping very well, and those planted in Gardens late frequently are steeped with very good Success.

I shall not here repeat what has been said before, about Steeping in general, but refer the Reader to it, where he may inform himself of what is necessary is this Particular; and therefore shall only mention, that I have frequently steeped the Windsor and other Beans in Milk, in Milk and Water, in what is called mudgel-hole Water, or the Water coming from a Dung-hill; and in Water in which Sheeps Dung was dissolved: in these several Liquids, varied different Ways, steeping for twelve, four and twenty Hours, and longer, and found they answered very well, I do not remember that any of them miscarried, and these are Things easy to be met with, and what may be usefully applied in almost any Quantity. I have not named the Kidney Bean above, for I apprehend that would be in the most Danger of suffering by steeping of any Sort.

The usual Quantity of Seed for an Acre is about three Bushels in the common Way, which is now found more than necessary; since Experience shews, that when they have more Room, they



they bear much better both on Account of their having Opportunity to spread in a freer Air, and more Sun to refresh them. And therefore both in the Drill Way of managing them, and according to the Advice of the Persons best skilled in the Management of them, they should not be set in Rows less than a Foot distant; and if wider the better, and not closer in the Rows than three Inches. The Farmer may easily proportion his Distances accordingly in any Manner of the planting them, as when the Ground is plowed for them, by missing one or two Furrows for their being any Way in Rows, gives him an Opportunity of hoeing and earthing them up: sowing any Compost amongst them, letting Sheep into them before they blossom, to top them if they run too much into Straw, or are infested with the pernicious Dolphin Fly, so frequently fatal to them; especially when they grow close, and in small Inclosures. Against this the topping the Beans is very useful, and so it is in the making them to pod the better when kept down, and from running too much into Stalk. The Gardeners do this with Sheers, and they may be topt to about two Foot high, or to three in the Field, in the same Manner, with no great Pains, or with a Scythe, or a short Scythe fixed in a proper Stick with less Labour.

It may not be amiss to remind the Farmer to take Care frequently to change his Seed, which is very necessary to be done sometimes, in all Sorts of Beans; and not to sow Beans in the same Ground soon. The best Method of changing is, by bringing Seed from stiff Land to that which is lighter, and from the lighter to the stiffer.

The Season usual for the sowing of Field Beans is, from the Middle of FEBRUARY to the End of MARCH: the strongest and the wet Land should be sown the latest, and the other Sorts proportionably sooner: some Regard is also to be had to the Weather.

*Of the Soil; and preparing the Ground for Beans.*

A strong moist Soil suits the Bean the best, and it prospers better in an open Exposure than when confined in small Inclosures; where it is most subject to Blights, and the pernicious Fly above mentioned; all agree that warm light Land is by no Means proper for Beans, though I have known some very good ones got on dry Lime-stone Ground, in small Quantities in Gardens.

Here it may not be improper to remark, How the Nature of the Lime-stone Soil alters the Taste of Beans, and other Vegetables; the greater Sweetness of sandy Soils than of some others, has been frequently observed. But I do not remember that the Alteration produced by good Lime-stone Ground, has been taken Notice of: which I can be more particular in, as I had Gardens both on dry Lime-stone Ground, and on Clay Ground, the former of which produced much sweeter Vegetables than the latter; tho' those on the clayey good Land would frequently produce larger Vegetables, especially Carrots and Parsnips: and as to Beans, there was so great a Difference, that

my Beans growing on the Lime-stone Land, and those in a neighbouring Village, which was all on the Lime-stone, were so sweet, that the Water they were boiled in, had not that disagreeable Smell and Taste which common Garden Beans give, but was as sweet as that Pease are usually boiled in, and was used commonly by the Villagers to make Pottage of; and the Beans themselves had a much sweeter Taste than those growing on the clayey Soil. And it is well known, that Lime-stone Land is very dry by its Nature, and mine was on the Top of a Hill.

The Vales generally do best for the Pease, the Chiltern or Up-lands being frequently too light and dry for them; especially if a dry Season follow, or the Ground be plowed oftener than absolutely necessary; by which it will be left hollow, or too light for them to stand, which is not the Case in the stiff Grounds. It will frequently admit several Plowings for them much to the Advantage of the Crop.

As to the preparing the Ground for Beans, there are two Things to be considered: When the Ground is only just broke up for them; and when, according to the Course of Tillage, it is to be prepared for, and set or sowed with Beans.

In the first Case the Ground is supposed to be in a proper Condition for a good Crop, and then such a Produce is expected. Also, that it should be useful in making the Land mellow for an After-Crop of Corn; and likewise, to keep down the Weeds. We are told by a very ingenious modern Writer, That these Ends, and much the greatest Produce will be obtained, if the Drill and Horse Plow be used to stir the Ground betwixt the Rows of Beans.

How far the Horse Plow will answer as to Weeds, has been shewn before. But the strong Objection against it in this Case is, That it turns the Weeds toward the Beans, and that it is then more Trouble to get them out there, than the hoeing the whole with the Hand Hoe. I know an excellent Farmer who chose last Year to lay out fifteen Shillings an Acre in hoeing his Beans by the Hand Hoe, as the best Way; not that he expected his Beans to pay him, but in order to prepare his Ground clean for a Crop of Wheat to follow; Beans being known not to impoverish the Ground, but rather to improve it for Wheat. Though it throws out great Productions, however, it mellows and lightens the Land for After-Crops of Corn: but this Farmer was right where Ground is fresh, and some prepared Compost on it since broke up. The Land is commonly plowed early in Autumn, and they let it lie in Ridges till about CHRISTMASS, by which it has the Benefit of Winter Frosts and Weather: the Advantages of which have been before mentioned; after that it is then plowed in smaller Furrows. Two Plowings will make the Ground fine enough till it is plowed and sowed, when the Furrows should be made shallow.

The common Method of Plowing and Sowing being directed in a former Part of this Work, I shall not meddle farther in that Particular, nor repeat any Thing there mentioned.

In



In Case any Improvement is found proper to be added to them, during the Time of their Growth, almost any Compost may be spread amongst them; and will presently incorporate with the Soil, on the loosening it either by the Horse Plow or Hand Hoe; but he must be a bad Farmer who has not his Ground in common good Heart for Beans.

Sir HUGH PLAT mentions the sowing two Bushels of Salt amongst the Beans, at several Times; and why may not some Sea Sand be sowed amongst them; or some Sea Water conveyed amongst them; these are known to fertilize Ground prodigiously, and to be great Destroyers of Weeds and Vermin; and these are still to be had without Duty; and in many Places may be ordered without any Expence, and with very little Trouble. In CHESHIRE I have known Brine poured on Pavements, to destroy Grass and Weeds, which it will do effectually; and I ordered a Cart Load of the Sweepings of a Salt-work to be spread on a Parcel of very rough Ground, and it being laid thick on about two Hundred square Yards, destroyed every Vegetable on it, Furze, Grass, and so on, but would enrich the Ground for the future, and it would, by Degrees, become fruitful, as the Weather, Frosts, Rains, and Winds, and the penetrating Air alter the Salts in the same Manner as the Salt Marshes, when enclosed from the Sea gradually discharge their over Quantity of Salts, and become improved into good Pasture Ground.

Small Trials of this Kind are easily made; with little Trouble, and at no Expence, and without the Hazard of any considerable Damage; and that the Reader may know the Proportion of Salt which there is in common Sea Water, a Gallon of Sea Water will produce about four Ounces: it being incontestably proved, by repeated Experiments (some of which I have made, and found true) that two Pounds of Sea Water, taken from the Surface, contains an Ounce at least of Salt, or the thirty-second Part of its Weight; and when the Water is taken from the Bottom it will produce some small Matter more.

Common Salt weighs about fourteen Pounds to a Peck, the fourth Part of a Bushel.

There are several other Things which might be mentioned as proper for the same Purpose, but some of them will undoubtedly occur to the Reader's own Observation, from what has passed; and others will fall into Consideration under the Advantages of Beans, which we come next to treat of.

#### *Of the Produce and Advantages of Beans.*

A Reverend Author (exclusive of some Advantages arising from the new Husbandry) reckons the common Produce of Beans to be about twenty Bushels the Acre, which allowing three for the Seed is about seven for one; and adds, "That no Grain yields a greater Increase than this, if it is rightly cultivated", nor turns to greater Profit to the Husbandman." He then mentions one single Horse Bean producing ninety Pods or Kids, containing two Hundred and thir-

N<sup>o</sup> 33.

ty-two Beans, which the next Year produced three Gallons; the next Year seven Bushels and an half, the next Year seventeen Quarters and two Bushels in four Years from one Bean.

But what is two Hundred and thirty-two Beans from one, in Comparison of three or four Thousand Grains produced from one single Wheat and Barley Corn, of which certain Proofs have been before-mentioned; or what is the Produce of seven Bushels of Beans for one, in Comparison of above ten for one commonly had from Wheat, or twelve or more for one commonly had from Oats.

A very ingenious Writer mentions thirty Bushels as a Produce of Beans not uncommon from good Vale Lands, per Acre, and that there may be an Increase of ten Bushels the Acre more by the modern Husbandry, if regularly pursued.

Now taking the Produce at thirty Bushels as a Medium, which to be sure is a full Allowance, and deducting the Seed there will be twenty-seven Bushels clear, which, at two Shillings per Bushel, will amount to two Pounds fourteen Shillings.

Out of which deducting Rent eight Shillings.

Three Plowings, twelve Shillings.

Harrowing, Hoeing, and Weeding, eight Shillings.

Reaping, Loading, and Threshing, six Shillings, for the Straw is of no Value to speak of; the whole of the Outgoings are one Pound twelve Shillings, which being deducted from two Pounds fourteen Shillings the whole Produce, there will remain clear, one Pound two Shillings.

But what is this, compared with the Profit of a middling Crop of Wheat, or such a one of Oats; and yet, in this Estimate I have deducted nothing for any Manure which Beans may want, or occasion the Want of to continue the Ground in a proper Course of Husbandry.

But we should not do Justice to this Species, should we omit any other Advantages it is usually attended with, or may be thought reasonably capable of producing, either according to the old or new Husbandry.

Besides the Profit above-mentioned, it gives the Farmer an Opportunity of changing his Grain, and consequently so far occasioning the Production of better Crops of Wheat, Barley, Oats, and Clover, in their successive Turns as was before-mentioned, and fully proved; it being undoubtedly true, that the longer any Grain is deferred before it is sowed again on the same Ground, the better the Crop may reasonably be expected to be.

Another Advantage of Beans is, that they give an Opportunity of planting or setting other Roots betwixt the Rows, which will not hinder the Growth of the Beans, and may bring in a considerable Profit; and whoever looks into a good Gardener's Ground, will soon see such Varieties of this Kind, as to give him sufficient Choice of this Sort. This the Gardener's call, under cropping, and great Variety of Vegetables, as Carrots, Turnips, Lettuce, and many more of the same Nature may be sowed or set in the Interstices.

Pease have frequently been sown, and are thought



thought to do tolerably well with Beans, and it is said may be advantageously supported by the Beans, but I apprehend that wherever they clasp round the Beans, there can be no Expectation of any Pods from the Beans as far as the Pea reaches; however, Pease may be safely sowed betwixt them, when the Beans are set in Rows two Foot asunder. Which Distance the best modern Writers allow as producing the best Crop, where there is tolerable Compass of Ground, which is the Case when Beans are sowed in the Fields, which we are now upon.

Turnips sowed betwixt the Beans would be found to answer very well, both as a Crop of Turnips, and for the keeping down the Weeds, which would be here a considerable Article.

When the Ground is hoed, or the Beans earthed up, the Turnips might be sowed with very little Trouble or Expence, and the Mould would then be loose for them to strike in; and there would want nothing but a raking them, to cover them a little, and there can be no Doubt of their succeeding well.

Or if some Turnips were transplanted, and set at ten Inches or a Foot distance betwixt the Rows, this Work would be readily done, and undoubtedly produce very large Heads, as I have frequently experienced in often removing Turnips; which is also done when they are transplanted for Seed, and I should not doubt their producing good Turnips too, and large enough for all useful Purposes; though such a transplanting must be thought to give a Check to their Growth, but that may be allowed for in the Time appropriated to them.

The Drill Method of sowing is thought not to suit Beans very well, both on Account of their Shape, which is an Obstacle to their falling regularly in the Rows; and they requiring a stiff Land, and being frequently sowed in the rich Vale Land, this Method of Husbandry does not well suit that Sort of Ground, as one of the warmest Writers for the Drill Method of Husbandry confesses.

#### *Of reaping Beans.*

Beans are usually reaped with Hooks, after the same Manner Pease are, or shorn after the Manner of white Corn; and in both Ways after bound up in Sheaves, and set on an End together, as Wheat is in the South.

They are commonly bound with Straw Bands, but the better Farmers buy a coarse Sort of Hemp Twine by the Hundred Weight at a small Expence, and cutting them into proper Lengths, bind up the Bean Sheaves with them; and this makes every thing after easy and commodious in the Management of them; and by allowing about three Inches more than necessary the first Year, for the Loss of cutting them open when laid on the Floor for threshing, they will serve two Years very well.

Beans are frequently malted, and mixed with other Malt for brewing of Ale, and answer to several very good Purposes.

#### *Of keeping Beans.*

Beans will keep in Sacks in a common Chamber very well, for a considerable Time, or in a

Stack in their Straw if dry when placed there, and kept dry. And some keep them in Hair Bags, to secure them against Vermin.

There is an odd Custom in Essex, of putting four Bushels in a Sack, and at HEMPSTED Market, not far from St. ALBAN'S, so famous for Wheat, is a worse, for they put five Bushels of Wheat in a Sack, which is above three Hundred Weight.

In the midland Counties they only put two Bushels into a Sack, and two such Sacks on an Horse for a Load to the Market, which Sacks are readily and easily carried about; and answer every useful End the above Methods of these Southern Counties can be thought to do.

But to facilitate the Removal of these Sacks in their Granaries, and other Places, they have a small Machine in Essex, and I suppose in other Places, which does it with great Ease; and as it is very convenient, and may be greatly improved, and costs but one Shilling and Eight-pence, or two Shillings, the making, I shall here give the Description of it.

#### *A Machine to wheel Sacks of Corn, in Granaries, Corn Chambers, &c.*

It goes on two wooden Wheels, the Diameter of which is five Inches, pegged on the Outside with wooden Pegs through the End of the Axle-tree, which is eighteen Inches long, and where square an Inch and an half, and fastened in the Stilts, which are there a Foot asunder, and the other is round for the Wheels to run on.

The two Stilts which guide it, are like those of a common Plow, are three Foot six Inches long, and kept asunder and firm by a Slat let through them at two Foot high, where the Stilts are better than fourteen Inches wide betwixt them, and two Inches and an half on the Side, and an Inch and an half Front, and grow narrower in the Substance, but wider betwixt them to about seven Inches, and then are rounded and bend backward to handle them by.

At the Bottom a Board four Inches and an half broad, and an Inch and half thick, is let a little into the Axle-tree and Stilts, and sloped downward; and the under out Edge of the Board is taken a little off, so that it falls near level with the Bottom of the Wheels, and the Machine stands upright when set on the Level, but is bent backward by the Handle when the Sack is on it, and the Sack will rest on it as it stands.

An Iron Plate an Inch and an half broad, is nailed six Inches on the Bottom of each Stilt, and along the Axle-tree, and two Inches over the bottom Board, to strengthen it.

Cross the Outside of the bottom Board a Rib is nailed, an Inch and an half at each End, even so far, but the Middle rises gradually each Way to a thin Edge, which, on bending the Stilts forward, goes under the Bottom of the Bag, and when the Top is pulled on it to the Stilts, and this keeps the Sack from slipping off.

The Substance of the Weight rests on the Wheels, and is easily turned any Way by the Stilts or Hands.

Most People know the Weight a Person may draw or wheel with Ease, in Comparison of what they can carry; and the common Waggoners



goners draw three Ton with five Horses, when twelve Hundred would be a sufficient Load for them.

And why may not a Board be fixed to it, at the cross Bar, and be opened when wanted, and set on the Foot Board by an Iron, to drop down and hold it, as is often done in Seats; on which almost any Thing might be carried from Place to Place, or the Wheels might be made deeper, if thought necessary, or a Pair of larger Wheels occasionally be easily put on the same Axle-tree.

To these Articles we shall add four more of the Pulse Kind, Pease, Tares, Chiches and Lentils; and thence we shall be led according to the Course marked out in our Plan, to the Grasses.

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## CHAP. I.

*Of Peace.*

**T**HE Pea appears to us at present under so many Forms, that there is need to explain them separately; distinguishing which properly belong to the Farmer, and which solely to the Gardener. About great Towns, particularly London, the Farmer sows some Kinds of the Garden Pea, and the Gardener makes his Plantation in the Fields, so that they intrench upon one anothers Province. There are therefore some Kinds of Pease to be considered as being brought into Use in common between them; others that are peculiar to the Farmer; and another Class, that the Gardener is alone concerned withal. Of the two former we shall treat in this Place; with the third, the Farmer having no Concern, we shall not meddle.

It will be first proper to shew the Husbandman what the Pea is ; what are its really distinct Kinds, and what its Varieties : for these last are by much the most numerous, and are called by peculiar Names, as if distinct in their Nature like the others. The Art and Industry of Gardeners will vary these for ever, but the strict Observer will consider them as accidental, not real Changes.

The Pea is a climbing weak Plant, with long slender Branches, and numerous Leaves, furnished with Claspers or Tendrills, by means of which it lays hold of whatever stands near for its Support. The Flowers are of that Kind, Writers call Papilionaceous, from their resembling in Form a Butterfly, in Latin Papilio; and they are succeeded by Pods, in which are contained the Peas, which are naturally round; but vary in Size and Colour according to the Species, or the accidental Variation made by Culture.

The Flower of the Pea stands in a little green Cup, formed of one Leaf, divided into five Parts, the two upper of which are larger or broader than the others.

The Flower itself is composed of four Leaves, in the Manner of the others of that Kind. One stands upright and is very broad, two stand sideways, and are short and roundish. The former Botanists call the Vexillum, these two the

Alæ; the fourth Leaf stands at the Bottom, and is short and compressed, this is what they call the Carina.

Within this Flower stand ten Filaments, nine of these are short, and grow together; and one is longer, and stands separate. This Distribution of the Filaments gives Origin to one of the new Classes in Botany, called Diadelphia. All these Filaments have roundish Buttons on their Tops.

Among them rises the Rudiment of the Fruit or Pod: this, while the Flower lasts, is very small and flatted; and there rises from it a membranous Thread, to the Side of which, near the Top, there grows a little Head pierced for the Reception of the Dust, from the round Heads of the Filaments.

This Dust impregnates the Seeds, and when the Flower is fallen they swell, and the Rudi-  
ment grows with them, forming the Pod and  
Pease. We shall hereafter mention those Vari-  
eties of the Pea rising from Culture; but are  
here to take Notice that there are four Species,  
which, from their general Form and Manner of  
growing, are plainly and really distinct Kinds,  
owing to Nature, not to Art, or the Accidents  
of Culture: these are,

1. The Garden Pea, which may be called the white Pea, or the manured Pea in general. This is the Origin of the several Varieties hereafter to be named.
2. The Field Pea.
3. The Sea Pea.
4. The simple leaved Pea, or Ervilia.

The first, or Garden Pea, is known by having winged Leaves, and several Flowers upon one Foot-stalk. The second, or Field Pea, has but one Flower upon each Foot-stalk. The third, or Sea Pea, has an angular Stem, and several Flowers upon each Foot-stalk: And the fourth differs from all the others, in that it has simple or single Leaves.

What are called winged Leaves, are composed each of several Pairs of others; but this has them single. The first of these is the Pea we commonly cultivate in Gardens, the second is that sown in Fields in most Places in the Country: and under each of these really distinct Species, there are many lesser Varieties: the third, or Sea Pea, is wild in ENGLAND, it grows on the Sea Coasts, in barren naked Cliffs of Rocks, and among Pebbles where no Earth is seen to give it Nourishment. The fourth is a Native of the Greek Islands, and of several Parts of EUROPE.

It is a memorable Circumstance, that in a Time of great Scarcity of Provision, the People about our Coast found the Sea Pea in great Plenty, and fed upon it. Till Necessity had sent them to its Stores, they never had observed it, and they then thought it sent by Miracle to their Relief.

The Reason of its growing and thriving where no Earth appears is, that it sends the Roots to a great Depth, and then finds it. The Produce of it is very great in its wild State, as appears by the Numbers who were in that calamitous Time supported by it; and there are Reasons enough to try how it would answer by Culture.

**There**



There are many Acres of naked and waste Sea Beach in this Kingdom, on which nothing useful grows at present; it would therefore be highly worth while to try what would be the Effect of sowing this Native Sea-Pea upon them.

We see it will serve for Food to ourselves; but if only for Cattle, it would still be worth raising.

## C. H. A. P. II.

### *Of the Varieties of the Garden Pea, called the several Kinds of Garden Pease.*

WE have shewn what the Pea is, and what are the really distinct Kinds of it: we are now to lead the Husbandman into the Wilds of Art; and enter upon the Kinds made from the first by Culture. This is a Store almost inexhaustible; and is every Day increasing. We know how the Florists raise a Variety of Auriculas, Tulips, and Carnations from a few Original Kinds, and so it is in the Pease. Good Ground, and careful Management, go a great Way; and the Mixture of the Dust from the Buttons on the Threads in one Species with that of another, and its going in this Mixture, or singly, to impregnate the Seed does the rest.

One Way or other a great Change is made, and the Table is supplied with an excellent Variety at different Seasons.

If we were writing to instruct the Gardener, we should enter at large upon this Head: but as the Husbandman has less Concern with it, we shall treat it the more lightly; not omitting it however, as he may in particular Situations find it profitable to fall into the Practice, nor neglecting any useful Caution. The three most distinct Varieties, are, first, The great or Rouncival Pea, distinguished by its Size. Secondly, The square Pea, distinguished by its Shape; and, thirdly, The umbellated Pea, distinguished by its Manner of growing, which is in round Clusters, resembling an Umbrella. These the Curious look on as the most remarkable Varieties of the Pea, but the Gardeners enter into a longer Detail.

Their principal Kinds are, 1. The early Pea, called the Hotspur, and which Foreigners call the early English; our Gardeners having first brought it up.

2. The Dwarf Pea. This is a low Kind, but the Stalk is much firmer and stronger than the common one, wherefore it succeeds much better in many Kinds of Soil.

3. The French Dwarf Pea. This is less sturdy than our own, but the Pea is more delicate.

4. The soft shelled Pea. This has a Husk so tender and sweet, that it is eaten in the Manner of the French Bean.

5. The large Pea, called the maple Rouncival. This has a beautiful red Flower, and the Pea, when ripe, is variegated with several Colours. This is sometimes sown in Fields.

6. The Crown Pea. This is the same with the umbellated Pea before named, but the Gardeners commonly raise a smaller Kind than that described by Authors.

7. The Spanish Marotto Pea. This is of the Rouncival Kind, very large, when full grown, and distinguished in the dry Seed by a black Line.

8. The Marrowfat. This is distinguished by the Breadth of the Pod, and the Softness and Sweetness of the Pea; and is the same we used to call the Dutch Pea, and the Admiral Pea.

9. The Union Pea. This is one of the Rouncivals, well tasted, but very large.

10. The flat Rouncival. This last is a great Rarity in some of our curious Gardens; and is a Kind of middle Pea between the Rouncival or Marrowfat.

These are the most certain, and distinct Kinds, as they are called; we have already told the Husbandman they are only Varieties; and, on Enquiry among the Seedsmen, he will have his Choice of many more.

The four principal he should meddle with, if he do with any, are the common White, the Hotspur, the Rouncival, and the Marrowfat; and as it may sometimes be his Interest to cultivate one or other of these, we shall lay before him in general Terms, the Methods found most successful in this Way.

## C. H. A. P. III.

### *Of the Culture of the Garden Pease.*

EARLY Pease are frequently raised about LONDON, by the Assistance of Walls and hot Beds. This is done thus. They are to be sown under a warm Wall, or Pales, in OCTOBER. The Earth is to be drawn up about the Plants as they rise in Height, during the Winter, for by this Means they will be secured against the Frosts; and having been thus kept alive till the Beginning of FEBRUARY, they are then to be removed to hot Beds made for that Purpose, covered with fine Mould, and sheltered by Frames.

If the Winter be very severe, they must be covered lightly while growing in the natural Earth; and when taken to the hot Beds, they must be planted at two Inches Distance, in Rows a Foot asunder. They will thus flower and produce their Fruit at such a Season, as will make it bear a great Price.

The French Dwarf is a very good Kind for this Purpose; but this being a Piece of absolute Gardening, we shall not here enlarge upon it farther.

These forced Pease come earliest in Season; the next are the Hotspurs. With the former we cannot advise the Farmer, in general, to have any Thing to do, nor much with these, for they will take off his Attention from more important Things; if he have Plenty of spare Dung, and a Taste for these Matters, he may employ a proper Servant, and it may answer; but he must not regard them too much himself.

The Hotspur must be sown in a rich Mould, and warm Spot, in the End of OCTOBER; and the Farmer who will meddle in these Things must observe, that as the Gardeners make Varieties upon Varieties in this Article, that called the Master's Hotspur is the earliest and best.



He must get his Seed from some honest Person; and he must buy every Year; for if he sow that of his own Produce, it will degenerate.

As these rise in Height, the Earth must be drawn up about their Stems with a Hoe in dry Weather; and if the Frosts are severe, some old Pea Stalks, or other light Covering, must be thrown over them, and taken off when the Season is milder.

Being thus kept alive till Spring, they must then be carefully weeded, and kept clear of Slugs. If there be many of them in the Ground, a little Lime carefully spread will destroy them, and rather forward than hurt the Plants. Thus managed, the Pease will bring an early, and large Crop. The Spanish Morotto, which is properly a Rouncival, as we have said before, is to be sown in FEBRUARY; and in the Beginning of MARCH the common Rouncival.

After this there should be a fresh Crop of one Kind or other sown once in a Fortnight during the Season, and they will in this Manner ripen one after another, and the Owner will be able to supply the Market at all Times.

All the Care they require is, to keep them clear of Weeds, and to be cautious not to tear and destroy the Stem in gathering.

According to their Size they must be sown at different Distances: the largest Pease the farthest asunder.

We have in this succinct Manner given the Management of the Garden Pea, because not properly the Business of the Farmer: we shall now proceed to what is truly and perfectly so, that is, To the Management of the Field Pea, which is a very proper, and important Article.

#### CHAP. IV.

##### *Of Field Pease.*

THE Field Pea, like the Garden, is divided into many Kinds, the principal of which we shall mention; and assist the Farmer to understand their Nature, and to take the best Methods for their Cultivation. These Kinds are,

1. The white Pea. This comes the nearest to the Nature of the common white Pea of the Garden of any; and its principal Difference is, that it is smaller and less delicate.

2. The Grey Pea. This is a large and very useful Kind.

3. The blue Field Pea, called in many Places the Hog and the Pig Pea, though the grey might as well have been called so.

The Husbandman will find a Multitude of Varieties of each of these branched out in the same Manner as those of the Garden Kind, and named from the Places where they have been raised, and other trivial Accidents; but we shall cut off a great deal of Confusion and Perplexity on that Head, by telling him, That all that vast Variety are to be reduced to these three principal Kinds; and that these being very distinct in themselves, and very strongly marked by their different Colour, he will always find it

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easy to distinguish the three severally from each other, and know to which Kind he is to refer any of the rest.

The white, the grey, and blue Pea, are perfectly distinct, and require a separate and various Management; but then that which is proper for one white Pea is proper for all white ones, and so of the others.

The white requires one Kind of Soil, the grey another, and the blue succeeds best in a third. This is a very material Consideration, which we shall explain in the succeeding Chapter, in the Regard of the others. As it is with Respect of Management, so it is with Soil, all white Pease require the same Soil with the common white; all greys the same with the common grey; and all blue the same with the common blue. This being a Certainty, the whole Trouble of studying those separate Species may be spared to the Husbandman; for, in knowing how to manage these three, he knows all that can be required for the raising of them all, and need not perplex himself with useless Distinctions.

#### CHAP. V.

##### *Of the proper Soils for the three Kinds of Field Pease.*

EACH of the Field Pease succeeding best upon its peculiar and proper Soil, it must be the Husbandman's first Business to establish that Knowledge thoroughly in his Memory: for on that will depend his Success. Pease are very profitable, and a very useful Crop on many Occasions: when he is about to raise them, let him first examine the Nature of his Land, and then suit the Kind to it; for he may in the same Field be in a Manner sure of a large Crop of one Kind, whereas he must as certainly have a poor one of another.

It is a very singular Thing that there should be so much Difference in the Kinds of the same Plant, with Respect to the Soil they require; but Experience establishes that Doctrine; and when Experience is certain, and proved by frequent Repetitions, he is a very weak Man who goes against it.

The white Pea being most of the Nature of the Garden Kind, succeeds best upon that Land which is most like Garden Ground; therefore let this Kind be sown in a Field, the Soil of which is fine and rich. A deep mellow Earth, or a rich Loam that is not too sandy, are the two Kinds of Soil that suit best with this Species.

The grey Pea is hardy, and loves Moisture; for this Reason a clayey Soil suits best with it.

The blue Pea is hardy like the grey, but nothing hurts it more than cold and moisture, therefore its proper Soil is the light, sandy and dry.

These are the Distinctions of Soil for the three Kinds of Field Pease, and as we have before observed, the Husbandman needs not trouble himself about a Multiplicity of Names, but examine them according to their Colours, and perplex himself no farther.



All white Pease, of whatever particular Name, love a mellow Earth; all grey Pease, a clayey; and all blue Pease, a sandy Soil: this is the general Direction. As there are certain Soils that suit them particularly, so there are also several distinct Kinds of Manures; which best agree with them, according to their several Natures.

In general, Dung is the Manure that best agrees with the white Pea; and nothing enriches the Ground for the blue Pea like Lime. As we have mentioned a clayey Soil for the grey Pea, some may be surprized at our naming Marle as the Manure in which it most delights; but we have shewn in treating of Manures, that the proverbial Saying there is against marling of Clay, is not so universally true as has been imagined.

Any Soil in which there is Clay, will support the grey Pea profitably; and Marle will be found a Manure that will enrich it excellently for this Purpose, at the same Time that the Pea itself improves it for Corn.

This is an Article of great Consideration. The Pea not only yields a good Crop in itself, when sown upon its proper and peculiar Soil; but it serves the Husbandman in other Lights. It is always a Method of destroying Weeds; it improves the Land on which it has grown, and excellently prepares it for other Crops.

The Article of the particular Soil suited to each Kind of Pea, has not been hitherto sufficiently considered; and for that Reason the Farmer in general is not acquainted with the great Advantage of this Pulse.

He finds it serve in the Succession of his various Crops, and when Chance directs him to sow the right Pea upon the right Soil, he sees the Advantage in its full Light. These are called favourable Years, and the Expectation of them keeps up his Spirits; but what he attributes to some unknown Cause, may be the Effect of his own Care and Application; and what he thus finds from Chance now and then he may at all Times command from proper Management.

The grey Pea will yield its full Produce in those stiff Soils, which so well agree with its Nature, without the frequent Fallows, serving in the Place of a Fallow, while it is yielding all the Time so profitable a Crop; and so it is in each of the others, only observing this proper Management.

In Respect of Manures, Pease will always answer in some Measure to the Expence of them; and it is to be considered, the Profit is not to be expected wholly from these, for they exhaust the Land so little, it is not the less fit for a succeeding Crop.

The general Observation is, that Pease ripen earlier in Land that is less manured; but the richer it is made, the greater is their Produce.

Wheat, the richest and most profitable of all Grain, follows Pease excellently; and the Season of sowing the Wheat comes so naturally after that of gathering the Pease, that it seems as if they were designed to come after one another.

As soon as the Pease are cut, the Land should be plowed across; after this it should be har-

rowed, and then plowing it again in the Beginning of OCTOBER the Wheat is to be sown.



## C H A P. VI.

### *Of the sowing of Pease.*

**T**WO Articles are to be considered under this Head; the Quantity of Seed Pease proportioned to the Ground, and the Manner of placing them in it.

The Reader will remember what we have said with Respect to the Garden Pease; namely, that the larger the Sort, the greater should be the Distance of the Plants. The same holds good in the Field Kinds: and upon this depends the first Article of their Management.

Good Ground will enlarge a poor Pea, and a starving Soil will reduce one that is naturally large in its Size; but we can here speak with sufficient Certainty, knowing what is the Condition of the three Sorts into which we have divided Field Pease in Ground equally favourable.

The Farmer is then to know that the grey Pea is naturally the largest Plant, the white the next in Size, and the blue the least.

We have observed that a good Soil will enlarge the smaller Kinds, perhaps so as to equal these naturally larger, on a poor one; but there is also a Difference in the Size of the Plants among these different Varieties we have named, of these several general Species. All this is to be considered as the possible Occasion of accidental Variations; but, in general, the Rule is what we have here laid down; and, consequently, the greatest Number of Pease is to be allowed to the Acre in the blue, and the least in the grey Kinds; the white being kept as a Medium.

We say Number in this Place, because the Measures may deceive; the grey Pea being larger, consequently fewer fill the Bushel. This makes a certain Difference, but not so much as is necessary in the Management of the Plants as to Distance in the Field. The Farmers know this, and proportion their Measures accordingly; but though they are right in the Thing itself, they fail in the Degree, for they allow too large a Proportion of the great Kind.

The Allowance in the common Way of Husbandry, in those Counties where the Culture of Pease is best understood, is two Bushels of the grey to an Acre: they allow three Bushels to an Acre in the white Pease, and four in the blue. But all this is too large an Allowance; nothing succeeds so ill in a promiscuous and irregular Sowing as Pease, and when they are planted regularly, there may be an absolute Certainty as to the Quantity and Distance. The Time of sowing Pease differs also according to the Kinds; though this rather respects the Soil to which they are suited, than any Thing in the Pea itself.

The grey Pea is to be sown in FEBRUARY, because growing in a cold stiff Soil, it makes at first but a poor Progress. The Time for the white Pea is the Beginning of APRIL; and the blue may be sown a Fortnight later than this:



this: the Middle of APRIL is the best general Time.

The Husbandman who recollects what we have said on the Nature of Soils in our first Book, will easily conceive what we mean by this: we have said that sandy Soils make a quick Shoot in whatever is sown upon them, and therefore this late Time is very proper, for they have still enough of the Season for their Growth. The white Pea has a Soil of a middle Nature between these, and therefore it is to be sown at a middle Time.

We now come to the Manner of sowing them; and as a great deal depends on this in the common Way, and more may in a better Practice, we shall consider it at large.

The common white Pea is usually sown with a Broadcast, and harrowed in. This is that promiscuous and uncertain Method we have before mentioned, as so improper for Pease of any Kind.

The usual Method is to sow the grey Pea under a Furrow; and this is so hardy a Kind, that it may be put into the Ground any Time during the latter Part of the Winter.

The blue Pea is sown as the white, only thicker, and is harrowed in after the same Manner.

This is the common Way in many Places, but it is the worst of all. The first Improvement for the Planting of Pease was the Suffolk Dibble, so called from its Place of Invention or first Use. This is a Kind of Iron Rake with the Tines set parallel to the Handle. The Handle is of the same Form as in the common Garden Rake, the cross Piece is thicker, and there are four, five, or six large Iron Spikes let through it. The Way of using it is this, a Man goes over the Field with the Dibble, and Women follow him with Pease in their Aprons. He strikes it into the Ground, pressing down the Tines with his Foot upon the Back of the cross Piece. Thus four, five, or more Holes are made, into which the Women drop their Pease, one into each Hole, and leave them open. This done, the whole Field is lightly harrowed over, and all are covered together.

The Person who strikes the Dibble, generally goes over the Field backward and forward in Rows, or Lines, a Foot asunder, but 'tis done at random, and the Pease grow in a slovenly and irregular Manner.

This Method is very expeditious, and disposes the Pease with a Degree of Regularity; it is therefore, according to the common Practice, greatly preferable to the random Method of sowing them by Hand; but it is capable of easy and great Improvement.

In the first Place the Farmer who intends to set his Pease by the Dibble, should have three Kinds of them made according to the Difference of his Pease, and the Distance they require in growing. He should have one for grey Pease with the Tines five Inches distant, another for white with them at four, and another for blue at three Inches Distance. The Tines should be longer for the grey than for the others, and shortest of all for the blue; because Experience shews, That the Seed of the grey will bear

deeper Covering in the Ground; and this is an essential Article; the Seeds of no Crop whatever being more in Danger from Mice, Birds, and Vermin.

When the Farmer has thus provided himself with proper Instruments for his several Species, I would have him order the Dibbler to go over the Ground with Regularity, drawing a Gardener's Line across it for that Purpose, and working close to it. This would set the Rows exactly strait, and would make the work easier and less hazardous to the Hoers.

The several Rows might thus be easily planted at an exactly proper Distance, and that proportioned to the Kind in each. Thus for the common Husbandry the grey Pea Rows should be two Foot asunder; the white a Foot and half, and the blue little more than a Foot.

Thus would the Field be planted with perfect Regularity, and the Hocing and Reaping would be done the more easily. There would be a little more Expence, but very little in the first Operation; but this would be saved in the two others.

We have named here what may be called a middle Distance for the several Species, a finer or coarser Soil, a richer or poorer Ground make some Difference in what is to be done in this Respect. The Farmer having here the Medium, will easily make the proper Variations.

In some Places they follow the Garden Practice in the Field, opening Trenches by Line, and covering the Pease, when in the Ground, with Hoes. This is better than the Method by the Dibble, in that it leaves the Earth more loose all about them, but it is more expensive, and the other succeeds very well.

Having named what are the several Manners of sowing or setting of Pease in the Practice of the common Husbandry, it is Time to speak of what may be done in this Article by the Drill Plow, and the Horse Hoe, its happy and proper Attendant.

We have shewn how vastly many other Crops are capable of being improved by this Practice, but there is none that can be so greatly assisted by it as the Pea of every Field Kind; nor any to which it is so happily suited.

We have shewn the Advantage there is in setting the Pease in Rows by the Dibble, and mentioned wherein the Garden Method of the Trench and Hoe is superior to this; but the Drill Plow answers both Purposes together; it does better than either by many Degrees, and the Expence is greatly less.

We shall advise the Farmer to use this Method preferably to any other, and shall give him all the needful Directions for it in a very few Words. Having explained at large in a preceding Book the general Method of Drilling, and the Structure of its Instruments, a very little is needful to be said in suiting it to the particular Circumstances of any Crop.

Let the Farmer see his Instrument be properly made, and let him go over the Field sowing his Pease in double Rows, with a Foot Partition, and with four Foot Interval between every two Pair of Rows.

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The Pease will thus be let in regularly : the Earth will lie loose about them, they will shoot freely, and they will be disposed in the most happy Manner that is possible for Weeding and Reaping.

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C H A P. VII.

Of weeding the Pea Field.

AS we have laid down the several Methods of sowing Pease, we must give Directions for the weeding them accordingly, each Manner of sowing requiring its peculiar Manner of weeding. The general Design however being the same in all these Operations, the Methods severally necessary will be laid down in few Words.

When Pease are sown in the random Way, the Hoers are to be sent into the Field when the Crop is up, and to have Orders not only to cut up the Weeds, but to thin the Pease where they stand too thick, which they always do in some Places, however careful the Hand may have been that sowed them.

Pease are round and smooth, therefore they will, from their Shape and Surface, roll about easier than any other Kind of Seed. We have shewn before how apt Corn is, when sown in the common Way, to run in Heaps in the Holes, and leave other Parts of the Field destitute ; but this is much more the Case in the Pease, because of their Figure, and hence it is that of all Seeds sown promiscuously they are the most apt to rise in Clusters. The hoeing them thinner in these Places is also the more needful, because in no Case the Plants more hurt or impoverish one another.

For these Reasons the Farmer must be careful in his Instructions ; and must keep his Eye now and then upon the People, otherwise he will have a much poorer Crop than he need.

When the Pease are set by the Dibble, made according to our Directions, the Hoer's Business is reduced to the one Point of cutting up the Weeds : and it is by much the more easily done, because he is to work in regular Spaces.

In the other Way, by the Trench Hoe there will be the same Advantage of a clear Space to work in ; but as the Seeds have been there scattered a little at Random, the Hoers must be ordered also to thin them in the Rows where they meet with Spaces, in which they stand too thick.

These are the Methods in the several common Ways of planting this Pulse, and the Advantage of the Hoeing is not confined to the present Crop ; for destroying the Weeds, it prepares the Land excellently for that which is to follow.

In the Method we have proposed of sowing by the Drill, the Horse Hoe, as well as the Hand Hoe, is to be employed ; and the Effect of this upon the present Crop is prodigious, while at the same Time it acts as a thorough Fallowing of the Land for that which is to come afterwards.

We have shewn to what a Depth the Root of the Sea Pea will penetrate the Earth for Nourishment, all Pease are inclined to the same Parti-

cularity ; and as few Plants with fibrous Roots penetrate deeper, none whatever spreads farther under the Surface at the same Time.

This may shew as the Reason of what we see in Practice so certainly, that there is no Crop which receives such great, palpable and evident Advantages from Horsehoeing.

We see how deep the Earth may be moved advantageously for Pease, and there is no Way of doing this but by that excellent Implement the Horse Plow ; and as the Advantage, in this Respect, is much less from Handhoeing, which only just breaks the Surface, so it is in Respect of the improving the Ground for future Crops.

When the Drill Plow has been employed in setting the Pease in double Rows, and in the large Intervals, as we have directed, the Horse Hoe must come in to clear those Intervals and nourish the Crop, and fallow the Ground ; while at the same Time the Hand Hoe is necessary among the Plants. This however need be used but once, the other must be repeated occasionally, and the Manner of using both is this.

When the Pease are about four Inches high, the Hand Hoers are to be sent in, but as they have only a very small Part of the Ground to work upon, a few of them will do for a large Field ; and a little Time will be sufficient.

When the Pease are at the Growth just named, they will stand according to this Method of sowing, in double Rows, with a small Space between Row and Row, and a great Interval between one Pair of Rows and another. The whole Ground between and about them, will be well cover'd with a young Crop of Weeds, for this is a Time at which they shoot in Abundance, and grow quick.

The Partitions or small Spaces between one Row and another, in each Pair, are the only Part where the Hand Hoers are to be employed ; the larger Intervals are to be left for the Horse Hoe, which is to be brought in afterwards.

In this Handhoeing these Spaces must be perfectly cleared of Weeds, and that being once done, is not to be repeated : for the young Crop being thus once got down, will never be succeeded by another in that Place. The Rows at this Time appear distinct in the Fields ; and there is Room for the Growth of Weeds between one of them and another, but soon after this the Pease grow to a Height, and meet one another, so that no Weed can grow between them.

This Handhoeing being over, the Ground is to be left to itself some time. The moving and breaking the Earth just about the Roots of the young Crop, on one Side, will do them great Service, as they now are young, and spread principally at a very little Depth : afterwards they will require a Supply at their greater Depth, and that will be given them by the Horse Hoe, though it could not by any other Means whatever. This is what they extremely want, and this is the Reason of that vast Fertility which will follow the Use of the proper Instrument to give it to them.

When the Weeds in the Intervals are grown to some Height, the Horse Hoe is to be sent into the Field : it must be carried straight up the Middle

Midst of every Interval; and it must be set to cut deep.

This will tear up the greater Part of the Weeds, and bury the rest, and will not shake the Plants by coming too near them, that being an Accident which, till they acquire more Strength, might greatly hurt them.

If the Farmer be very curious, he may now send in his Hand-Hoers again, with Orders to cut up the Weeds close on the Outside of every Row, as before they did close on the Inside. They are not now to go over their former Work again: that was confined to the Partitions between one Row and another; and this is in the same Manner to be confined solely to the Earth, on the outer Edge of every Row, or to those Outfides of each Interval which the single Furrow of the Hoe Plow did not affect.

This is a Thing not altogether necessary, but it is useful; and will very well pay the little Charge it costs, in the Increase of the Crop.

While this second Handhoeing breaks off the Ends of the short and slight Roots within its Reach, the deep Furrow in the Centre of the Interval, cuts off the Ends of all those longer and more serviceable Roots which had penetrated so far, and spread so wide, as some at this Period of the Pease's Growth will always have done; and from the broken Ends of these there will be innumerable others immediately formed, ready to draw Nourishment; and they will have a fresh broken Earth easily to spread in, and full of that Nourishment for them.

The Consequence of this will be an immediate great Shoot of the Pease, and they will gather a surprizing Strength.

As to the Repetition of this Horsehoeing, the Farmer may be left wholly to his Discretion. If he do no more he will be sure of a great Crop, for this new broken Ground will supply the new Roots, and all such others as shall spread into it with a great Quantity of Nourishment all the Time the Crop is to be upon the Ground: but if he chuse to repeat it twice more, the Advantage will be proportioned in his Crop, and he will be sure of finding a manifold Return for the Expence.

If he will be thus advised, and will give his Crop three Horsehoeings, they are to be conducted in this Manner.

The first must be given a few Days after the Handhoeing of the Partitions; and the two others at equally distant Times between that and the beginning to pod.

In this Case the first Hoeing is to be performed as mentioned for the single one, very deep, and in the Middle of the large Interval, between Pair and Pair of Rows. And the two following Horsehoeings must be more shallow, and must be carried in the middle Way between the first Furrow and the Rows.

Few will perhaps be at the Expence of such a repeated Horsehoeing on a Piece of Pease, without seeing the Advantage thoroughly explained; but that is in itself so clear and evident, when the whole Compass of the Work is taken in, and the Benefit to the Crop considered, that we shall be able to shew every thinking Husbandman it is to his real and great Profit.

Two Points are intended by the sowing of Pease; the one to get a profitable Crop; the other to prepare the Land for Corn. Now both these will be answered in the highest Degree by this Method. His Crop will have the Advantage of such a Degree of Nourishment, as could not be given to it any other Way, and the Produce will be great accordingly: and at the same Time the Land will be prepared for Wheat by such repeated plowings, by Way of fallowing, that there is no Method whatsoever of making it so rich, or dressing it so well for that Grain.



C H A P. VIII.

Of reaping of Pease.

THE Pease being come to their Growth, are to be watched for the Time of gathering. This is to be timed carefully, for it is of Importance that the due Ripeness be observed. In the Plantation of Garden Pease in the Field, the common Method of pulling them as they ripen, is to be followed; but in the Farmer's Concern, where they are not of that Kind, nor intended for that Use, they must be reaped at once; and it is on this Occasion the finding the due Degree of Ripeness is of such great Concern.

In the gathering by Hand Women are to be employed, and they are to be sent into the Field daily, to gather as the Pods successively ripen, so that the Profit rises daily; and it is to be begun as soon as any are fit to pull, and continued as long as there are any in a Condition for Service left. For this there needs no particular farther Direction.

In the Farmer's Pea Field let there be all Care taken in examining the Pease, from the Time the Pods begin to swell. From this Period till their ripening, which is known by the Size and Firmness of the Pea in the Shell, the Owner himself should every Day go into the several Parts of the Field, and open Pods in different Places.

All will not ripen together upon any Ground, but he will thus know when most are ripe together.

He will lose some by shedding, and some will be unripe at whatever Time he reaps them, but he is to contrive so as to lose the least by one or other of these Accidents. In general it is better to err on the Side of their being under ripe than the other; because those which are but moderately ripened, will thus harden in the drying; whereas, when the Field in general is too ripe, a great deal will be lost by shedding.

The best Method of reaping is by a Hook with a good Edge, fastened to the End of a long Handle. A dextrous Fellow will do a great deal of Business in a Day with this Instrument, in a Field of Pease sown in the common Manner; but in one where the Pease are planted regularly, the same Hand will go through such a Quantity as is surprizing.

When the Pease are cut down, the Way is to leave them to dry a little upon the Ground; but when they lie in a scattered Manner there is more Harm than Good done by this.

The Reaper should be ordered to throw them up in small Heaps, as he cuts them, and thus they will lie conveniently, be less in Danger of Vermin, and ripen without shedding.

Nothing is so easy as this tossing them on an Heap, as they are cut with the long Hook; and this should be done in so careful a Manner, that the Heaps may lie hollow and light: this gives the Wind free Play among them; and if Rain happens, they are in the less Danger of being spoiled.

When they have lain in this Manner till the Stalks and Pods are dried, and the less ripened Pease have got their due Firmness, they are in a Condition to be carried in, but that should be done with Care and Discretion, that too much be not lost in the shaking.

CHAP. IX.

Of Tares.

THE Tare is a low climbing or drooping Plant, resembling the Pea in its Manner of Growth, but smaller. The Stalks are weak, and lean on the Ground. The Leaves are each composed of several Pairs of smaller, of a pale green Colour, and there are Tendrils for climbing or hanging upon any thing. The Flower resembles that of the Pea in Shape, but is smaller, and of a mix'd Purple Colour in the common Kinds, tho' of various Hues in others. The Seeds are contained in slender Pods, and are round and small. Their Colour varies like that of the Flowers.

There are two Kinds of Tares, the white and the black. These are named after the Colour of the Seeds, and have little other Difference: they properly are only seminal Varieties of the same Species; the white Tare rising originally from the Seed of the black, as the common blue and red Flowers of many Kinds, in our Gardens will occasionally yield such as are white. In the same Manner the first Variation in this Kind of Tare is, that the Flower is white, whereas it is purple in the other; and the Seeds afterwards are of the same Colour.

Either of these may be sown in Fields, and they will answer the same Purpose; but the common or black Tare is the hardier Kind, and the best Bearer.

There may be a great Advantage in the sowing Tares properly, among the Variety of Articles with which the present Practice of Husbandry gives the Farmer an Opportunity of varying his Crop. They excellently prepare the Land for Corn, and their Produce is of a certain and not inconsiderable Price, being the proper Food of Pigeons, and useful to many other Purposes.

We have shewn the Profits of a Dove-cote, and hope the Reader has been made thoroughly sensible of them; wherever there are Pigeons there must be Tares raised or bought; and this is not their only Use, for the Straw, when well dried, is an excellent Food for Cattle. So that upon the whole, the Tare, though greatly inferior to many of the preceding Articles, yet is a very profit-

able, and very useful Crop at proper Seasons.

CHAP. X.

Of the proper Soils for Tares, and the Management of the Ground.

THE Husbandman will easily know, that if the Tare required a very rich Soil, or great Preparation for it, the Account we have given of its Value, would not make it worth his while to raise it; but this is not the Case: a very poor Land will support it; and it demands little Preparation.

It is a hardy Product, approaching to the Nature of a Weed; and it will therefore grow either on Land naturally poor, or such as is exhausted: this is what makes the Farmer find his principal Advantage in its Culture: for it not only thus stands in the Place of Barrenness, but prepares the Ground for better Crops.

Although most Soils will do for the Tare, yet, like all other Plants, there are some that it affects more than others. This is a material Consideration to the Husbandman. The great Variety of Articles of late Years introduced into his Profession, give him an Opportunity of varying the Crop on every Occasion, and among these inferior as well as among the richer Kinds, he will find a double Advantage in a prudent Choice, which is most shewn in suiting the Species to the Nature of the Soil.

The most favourable Land for Tares is a good sandy Loam. They will succeed excellently on mellow Earth, if not too moist for them, which is a very common Inconvenience in that Sort of Ground. They will succeed very well on sandy Ground, that is not rich in any Respect; and we see great Crops of them in the Lime-stone Countries, and that frequently where there is very little Depth of Soil.

The worst Ground for the Tare is a tough wet clayey Soil. In HERTFORDSHIRE, where a great Quantity are raised, they find them always succeed better on the hilly Grounds than in the Vales.

The Soil and Situation being thus fixed upon, there requires little Care in the making it ready for the Reception of the Seed. By this Choice we do not mean to tie the Farmer down so strictly, as that nothing else will do but such a Field as we have described, but when it happens that he has the Choice of two or three, and one of them answers this Character better than another, he should take the best.

We will suppose the Field where they are to stand, has been pretty well exhausted by the last Crop of Corn. In this Case no Preparation by Manure, or repeated Tillage is wanted: all that is needful is to plow in the Stubble; and let this lie to rot; and in Spring to open the Ground for the Seed: these Kind of Crops are so far from demanding Manure, that they serve as Manure to the Land themselves; and of them all none more than this Species.

C H A P. XI.

Of the sowing Tares.

WHEN the Land is ready, the next Thing is to take Care of the Seed, and in this the Husbandman should not be negligent: a little Care costs nothing, and it ensures a profitable Crop.

Let the Seed Tares be bought or purchased by Exchange from some Farmer, at ten or twelve Miles distant. The Advantage and Use of this, in all Seeds, has been shewn already; and let the Farmer who is to sow them take Care to purchase such as have grown on a different Kind of Soil from his own.

Thus, if his Field be mellow Earth let him chuse the Seed Tares from a loamy or sandy Soil; and on the contrary, if his be sandy let him chuse the Seeds from one that is not.

Those Tares are in general best for sowing that are of a middling Size, round, full, and plump, of a smooth and bright Surface, and heavy. There is Reason the Husbandman be careful in this Choice, because few Seeds are so apt to spoil; and all Pains are thrown away upon Land where there is a Defect in the Seed.

The Tare does not grow well unless it have been full ripe when gathered; and if it have suffered wet in the keeping, it loses a great deal of its Vegetative Power. These are the two Accidents the Farmer is most to fear, and he will be guarded against them by the Rules we have given for his Choice. Such Tares as have been gathered before ripe, never get that Roundness, Fullness, or Weight we have recommended; and if they have been damp, so as to get Damage, they lose their glossy Surface, and they do not recover that again.

The Seed being thus chosen, the Quantity is next to be considered; and in this the common Practice comes nearer what is right, than in most other Seeds. The general Error is the sowing too much, and what Mistake there is, is on the same Side here, but 'tis not great, about five Pecks are generally allowed to the Acre, but a Bushel is fully sufficient: three Pecks will be very well.

There is a greater Crop from a few flourishing Plants, than from a great Number which starve one another.

The best Time for sowing them is in the Middle of FEBRUARY. Very little Trouble need be taken about them, for the most slight stirring of the Ground is sufficient; but of one Thing the Husbandman must take especial Care, which is, the finishing what he undertakes in this Way without Delay. There must never be more sown in a Day than can be well covered before Evening; for if they lie exposed to the Dews of the Night, they contract a Damp that decays a great Part of them; and the rest grow poorly.

In general, a poorer is better than a more rich Land for Tares. In the former they pod well; in the latter, they are to run into Stalk and Leaf with less bearing. There is also another Misfortune attending the sowing of Tares

on rich Ground, especially if it be a little moist, which is, they are more apt to lie upon the Ground, because of the Weight of the Stalk, and then they rot.

There is an old Custom among the Farmers of ESSEX, and some other Counties, of sowing Tares and Horse Beans together: they thrive tolerably well in this Way, but they do better singly. There is no Difficulty attending the reaping of them, for they may be very well cut together, when ripe, as they will be about the same Time; and the different Sizes of the Bean and Tare make them easily separated in the Barn by a Riddle.

C H A P. XII.

Of the mowing and reaping of Tares.

THE Crop being in the Ground will require no farther Care of the Farmer, for they will shoot quickly, and grow vigorously, so that Weeds do not much thrive among them. There are two Seasons of cutting them, the one for the Straw, as it is called; that is, for the green Plant for the Food of Cattle, the other for Seed.

The first may be continued at different Times for several Weeks, and it is a very wholesome and profitable Food; the other is only to be done at one Time, that is, when the Tares are ripe in the Pods; and for the knowing the exact Period for this, the Tare is to be watched in the same Manner as the Pea.

The cutting them for Fodder is often the most important Service they can be put to; as to the letting them stand for ripening, it is for Seed, or for Food for Pigeons; but as when the Farmer keeps any Quantity of these, as he must either raise or buy Tares, this is a considerable Article.

If a favourable Season follow, the Time of sowing the Tares will be fit to cut in MAY for foddering Cattle in the Rack; and, upon Occasion, they may before that Time serve for feeding fresh in the Field.

The great Advantage of all these Crops of ordinary Pulse is, that they cover and shade the Ground. The Tare being larger than some of the others, serves this Purpose better than they, and its Seeds, or the ripe Tares being of Use, is another Advantage, because it may be kept longer upon the Ground. For this Reason, though the Farmer may occasionally cut his Tares green, yet I advise him when he would give the Ground the greatest Advantage from them, to let the whole Crop stand till ripe. In this Case the entire Field is covered for a very considerable Time, there are no Weeds suffered to grow in it, and the whole is mellowed by lying under the Covert of the Stem and Leaves of the Tares, while their Roots draw but little Nourishment to impoverish it. The Tares being then observed from time to time as they ripen, are to be reaped at the Period when they are fullest of rich Pods; and then left to dry in the Field in little Heaps, before they are carried home for getting out the Seed.

C H A P. XIII.

Of preserving of Tares.

THE Farmer has seen how easily Tares are damaged by wet, the Consequence of which is their growing mouldy, or musty: after this they never recover their right Condition, Look or Value: but, beside this, there is another Accident to which they are very liable, that is, the being infected with Worms, Mites, and other little Vermin. Now in this Case the pulpy Part is eaten, and they become light, dusty, imperfect, and of little Value.

We have told the Farmer how to manage them from the Sowing the Field to getting home his Crop; we must now acquaint him with the Ways by which the Produce may be preserved from these Mischiefs, for his certain Advantage in feeding his Pigeons, sowing again, or selling.

The Preservation of Tares from both these Accidents, depends principally on the drying of them; for, as it is Damp that moulds them, the same makes Way for those little mischievous Vermin, which are always found in damp Tares, but rarely in such as have been properly dried.

We have directed their laying some Days in the Field, after cut, for the Pod and whole Plant to dry. After this, when the Tares are got out, they must be managed according to the Weather, but one Way or other they must be thoroughly dried.

If the Air be very warm and dry, the spreading and turning them on a Floor for some Days, will answer the Purpose; if otherwise, they should be laid upon a Kiln: but, in this Case, the Heat must be very gentle, and well moderated, otherwise it may do more Harm than the Damp, destroying the vegetative Power in the Seed, and injuring it in its nourishing Quality.

When the Tares are thus properly ordered, they must be kept in a dry Place, and properly secured from Vermin. The thorough drying is very essential, for otherwise they will breed Disorders in the Pigeons that are fed with them; and, when used as Seed, not one in ten will grow.

When they are to be kept any long Time, the best Way is to put them up in large Barrels; then setting them in a dry, cool Place, they will be out of all Danger whatsoever. I have known Tares thus kept that were good for all Purposes at fourteen Years after the Threshing; and they probably would have kept good as much longer.

C H A P. XIV.

The Thetch, Fetch, or Vetch.

THERE are few Occupations among the common Part of Mankind, that give Origin to so many strange Terms as the Husbandmans. We

have been careful to explain them in the Course of this Work; and, we hope, by that Means have rendered not only our own, but the Writings of others more useful: the Subject of the present Chapter is an Instance. We see in most Books of Husbandry written of late Time, the Name of the Thetch, a Plant recommended extremely for the Improvement of Land. This is a Kind of Pulse very well known by its Appearance, and by the Shape of the Seed, in the Counties where it is customarily raised: but how is the Farmer in a remote Part of the Kingdom, who wishes to bring home the Improvements practised in other Places, to know what is meant by this Word? No Dictionary will explain it to him, for there is no such Word in the ENGLISH Language. If he look into the ENGLISH Herbals, he will not find it in any of their Indexes; nay, though some of them have a particular Table of barbarous Words, as they are called, the Word Thetch is not among them. The Reason is, that it is a Barbarism of later Origin than the Time of their writing.

In some of the Books wherein Thetches are named, he finds them also called Fetches, but this is a Word as arbitrary and unmeaning as the former, there being no such properly in the Language. In some it is, as they apprehend, farther explained by being written Vetches: but this is a Term that has worse Consequences than leaving the Reader in the Dark, for it creates Confusion. There is such a Word as Vetch in the ENGLISH Language, but it is the English of the Word Vicia in Latin, and therefore signifies the same with the Tare.

In the two other Cases therefore, these Writers use Words that cannot be understood, because they have no received Meaning at all; and, in the latter, they use a Word that means something else.

If the Farmer in a remote Part of the Kingdom, should from reading any of these popular Works, be induced to propagate the Thetch, he could never find any Meaning of that Word except the Tare; and he would therefore, after a great deal of Difficulty, find what they did not mean. Themselves know what they intend by it, because a Word will signify any Thing Custom appoints; but one Purpose of this Work being to convey to the Farmer of one County, the Knowledge of another; we must make them understand one another's Language.

There is a Plant of the Pulse Kind very frequent in the warmer Parts of EUROPE, the Flower of which resembles that of the Field Pea, but its Pod is short, and seems blown up. This they call in Latin Cicer, and its proper Name in English is the Chich. Some have called it the Chich Pea, others the Chich Vetch; and in speaking of the Seed, the common Expression is Chiches. When the Chich first was brought into Use among the ENGLISH Farmers, the Name puzzled them; and as they were accustomed to hear it spoken in the plural Number Chiches, they by one Mispronunciation after another, called it Cheches, Thetches, Fetches, and Vetches.

This then is the Pulse the Writers on Husbandry mean by the Thetch, and under these

Names

Names of Chich and Cicer, it will be found in the Writings of those who have treated of Plants.

The Chich, or as our Writers call it, the Thetch, is therefore of the Pulse Kind, but singular in the Shape of its Pod, and in other Particulars. We shall first make the Reader properly acquainted with its Nature, and its several Kinds, and afterwards with the most advantageous Manner of cultivating it for the Benefit of the Ground.



CHAP. XV.

Of the Nature of the Chich, and its Kinds.

THE Chich, like the rest of the Pulse Kind, is a weak and straggling Plant. The Root is inconsiderable, wherefore it does not penetrate deep, nor spread far for Nourishment, so that the Ground is not impoverished by it as by other Growths. The Stalks are numerous and weak, they will grow in the larger Kinds, three Foot long; in the lesser two Foot; but always lie upon the Ground. This is far from a Disadvantage to the Farmer, for by thus lying upon the Surface, they cover it the more perfectly; and make it light and hollow.

The Leaves resemble in their general Form those of the Pea and Tare, but they are more beautiful. Each is composed of three or four Pair of lesser ones, and an odd one at the End, and these are all of a very pleasant green, and notched round the Edges. The Flowers grow from the Bottoms of the Leaves, and are of the Shape of those of the Pea or Tare, but small. They vary in Colour according to the Kinds, being white, red, or dusky, and the Seed is of the same Colour, that follows them. The Pods that come after the Flowers are of the same general Structure with these of the Pea Kind, but they are short, thick, and blown up as it were, and each contains only one or two Seeds. These are not altogether round, but of a painted Shape in one Part, from whence fancy-full People have supposed they resembled the Head of a Ram, and the Plant has been called the Ram Chich.

The Chich is a Native of ITALY, and several Varieties of it are cultivated in the Gardens of that Kingdom; as also of SPAIN, PORTUGAL, and the South of FRANCE. They raise them there as we do Pease, and for the same Use at their Tables; whence their Gardeners, as ingenious as ours, have made innumerable lesser Varieties. But we are writing for the Farmer, and he is to raise them for a very different Purpose; therefore all the Distinction that he need regard is, that of the two Kinds which from their Size are called the larger and the smaller Chich, and from the Seasons of sowing them, the Winter and the Summer Chich or Thetch, the large one is the Winter Chich, for being more hardy it stands the Cold: the smaller one being tender, must be sown in Spring.

The Kinds cultivated in Gardens Abroad are principally three, the white, the black, and the red Chich; they are called by these Names ac-

ording to the Colour of their Flower and Seed, and are not there preferred to Pease, but are found better suited to the Countries. Our Pea is vastly preferable, according to the Accounts of the ITALIANS themselves, both in its Taste and Bearing, but it will not thrive so well with them as here; and these being natural to the Climate, are cultivated in a great Measure in its Stead. The ENGLISH Farmer is to count little upon the Fruit of this Pulse more than for Seed, therefore he is to see it in a proper Light, altogether different from theirs: with him it answers two Purposes, the feeding his Cattle in the Stalk, not Seed; and the Enriching of the Ground.

This Enriching of the Soil depends partly upon the keeping it clear of Weeds, partly upon the little Nourishment it requires, and partly upon the Covering and Shelter it gives the Surface.

This last is the greatest Consideration; for, when a Piece of Ground is lightly, but thoroughly covered, and little exhausted, it grows mellow, and becomes, with very little farther Expence, fit for the richest Crops. For this Reason the large Chich is to be preferred to the other as better covering the Ground: but this is not all its Advantage, for being sown in Autumn, it provides an early Food for Cattle when they most want it.

Notwithstanding this, the Farmer will find many particular Circumstances wherein the small or Summer Chich is preferable, with Respect to the Time of Sowing, the Nature of the Provender, and the Condition of the Ground.



CHAP. XVI.

Of the proper Soil for Cheches; and its Preparation.

THE Husbandman is to consider all these little Pulses in a very different Respect from the valuable Grains; as to preparing the Soil for them, that lies in a very little Compass, for they are rather sown to prepare the Land for something else; but in the Choice of the Ground, there is a great deal to be considered.

He has a Variety of these, the Tare, the Chich, and the Lentil: they will all, with proper Management, answer the same Purpose to him, and they will thrive variously on different Soils; therefore he is to understand what Kind suits each, that he may have the double Advantage of enriching his Ground, and increasing his Crop. For it is particular in these Species, that the larger they grow, and the more they yield as Fodder, the more and better they improve the Ground for a succeeding Crop: this will be easily understood from what we have said before on that Head.

As the Tare loves a dry Soil, the Chich will bear one that is somewhat damp. It is a proverbial Saying among the Husbandmen, that no Rain will kill a Thetch, and the same Quality of bearing heavy Showers while young, for that is the Season of them, will render it capable of living in a Soil naturally chilled by wet: but this

this must not be carried too far. Chiches will not live on a Bog. In all Things there must be Moderation.

The best Soil for the Chich is a soft mellow Earth: the Farmer would not allow this Crop a Piece of fresh Ground for that Purpose, but it will thrive excellently upon a rich Field of this Kind after Barley or other Corn.

Such a Soil as this would be excellent, as we have said, for Tares, but there may be Accidents wherein it would fail for that Crop, and yet notwithstanding which, it would be excellent for the Chich. Thus if a mellow Soil be upon a hard Gravel, that will excellently serve for Tares, because the Wet which falls will get through the lower Bed, after it has done its Office to the Roots of the Plants; on the other Hand, if a mellow Earth have a Bed of Clay under it, Tares will not grow upon it, because the Clay holds the Water too much, will chill their Roots, and make the Plants poor and yellow. Now such a Piece of Ground as this will do excellently for Chiches indeed, better than any other: this is a Sort of Difference the Farmer should remark carefully; one of these Soils will do for one, the other for the other Crop; and he who if he had sowed without Consideration, might have had very indifferent Crops of both, will, by thus examining the Soil, and suiting the Crops to it, have very good ones from both.

After a good rich mellow Earth, the best Ground for the Chich is a stiff Loam.

Loams may be considered as Soils of quite different Qualities, according to the various Compositions or Quantities of the Mixture. All of them have some Sand and some Clay: but when the Sand is in the greatest Quantity, they are loose and warm Soils; when the Clay, they are stiff and binding. In the former Case their Dryness and Warmth make them very fit for the Tare; and, in the latter, their Stiffness and binding Quality retaining Moisture, make them suit the Chich.

The proper Soils being chosen, there is little Trouble in preparing them, but some Difference in the Manner of working when the Seed is to be let in, according to the Nature of the Ground.

All that is required for these Crops, when they follow Corn, is to plow in the Stubble; this soon rots, and is all the Manure that is, or need be allowed for them, the Ground will be in sufficient Heart to produce them.

C H A P. XVII.

Of sowing Chiches.

THE proper Management of these lesser Pulses is so considerable an Article in the whole, though less in their immediate Value, that they are very well produced in a Year that would have been useless in that Respect, being the Time of Fallow; and when they are eaten upon the Ground under proper Regulations, they give the Land, by Means of the Dung and Urine of the Cattle, a very good Dressing.

The large or Winter Chich, is to be sown the first Week in OCTOBER, or thereabouts, and by this Means it will get a good Root, and a strong Head, and will be able to stand against the Frosts; and, when Spring comes, will push so vigorously, as very soon to be in a Condition for eating on the Ground, or mowing for that Purpose.

The lesser Chich, called the Summer Thetch, should be sown in the Middle of FEBRUARY. The Rains that naturally follow at this Season, push it up in the Shoot, so that in a favourable Time it will be ready for cutting in the End of MAY, or very well in the Beginning of JUNE, and may be eaten upon the Ground sooner. The Winter Thetch, if sown early in OCTOBER, will be so well grown by LADY DAY, that Sheep and Lambs may very well be fed upon it; and this is a Season when proper Food is so much wanted for them, that they may very well pay the Expence of getting it up so soon.

The first Thing to be considered toward the Sowing, when the Land is ready, is the Choice of the Seed; and after what we have said with Regard of Tares, a few Words will give the necessary Information in all Pulse: the Danger is, that there are Vermin, and that there have been Damps, this may be discovered by the dead Look, or the dusty Appearance of the Seed; and, in either Case, that is to be rejected. Let the Farmer chuse such as is bright, weighty and free from Dust, and he will not be disappointed.

The Quantity would naturally come next to be considered, but in this, as the Manner of Sowing, suited to different Soils, makes some Variation that must be explained first.

If the Soil be clayey, or of a stiff Loam, the Manner of Sowing must be this. The Ground must be broke with the common Wheel Plow, and the Seed scattered in by Hand in that Manner the Farmers call spraining of it, in Ridges: It is thus to be plowed in; and after this, the Land is to be harrowed even, only leaving Water Furrows between the Ridges.

In this Manner the Accidents attending leaving the Seed uncovered, which are the same with Respect to the Chich, that are in the Tare, are prevented. None of the Seeds are left exposed to the Dews of the Night, which would have very bad Consequences.

When the Soil is a mellow Earth, with a proper Bottom, I shall advise the Farmer to sow his Chiches in broad Lands, with a single Plowing, harrowing them well in.

The Use of the Crop is also to be considered before the Sowing, that a proper Method may be taken to prepare in Time for it. Thus some are of Opinion, that eating on the Ground is best, and others prefer the Mowing and carrying off. This, when the Land is of a middling Nature, may make a Difference in the Manner of Sowing, and when any one of these two Methods are rendered necessary by the Quality of the Ground, the Husbandman must conform to that Necessity, rather than to the common Opinions. We mean this. When Chiches are sown on Ridges, they should be eaten upon the Ground, because Mowing is difficult in this Condition

Condition of the Land; on the other hand, when they are sowed in broad Lands 'tis best to mow them.

In general mowing is much the best Method. All Cattle tread down and destroy more than they eat, and it is a Certainty in general, that the Produce of one Acre mowed and carried to the Rack, will go as far as that of two eaten upon the Spot.

As to the eating of Sheep and Lambs they do less Damage than such Cattle as have broader Feet, and their Dung and Urine, and the Moisture from their Bodies where they lie, gives a Richness to the Ground that may, in many Cases, make amends for the Damage: but this is not the Case with Horses. In wet Seasons they cannot be turned in at all; at best they destroy a great deal by their spreading, heavy Feet, and they can come upon the Ground but once; whereas the same Crop may very well be eaten twice by Sheep and Lambs in Spring.

The Nature, Manner, and Differences of plowing being thus understood, we may speak of the Proportion of the Seed which varies accordingly.

When the Chiche is sown on Ridges, after Wheat or Barley, two Bushels and a half of the large or Winter Sort will be a proper Allowance to the Acre, and of the small Sort three Bushels. When it is sown in broad Land three Bushels of the large, and two and a half of the small, is the proper Allowance. In either Case this is proportionably a much larger Allowance of Seed, than we recommend on other Occasions, but the Difference is proper when we consider the Nature of the Crop.

In most other Kinds we depend upon their Produce in the Grain or Seed, therefore a few Plants well nourished is what we should aim at; because these will yield a better Crop than a large Number that are starved: but here the Farmer does not form his Expectations of any such Crop. Two Points are to be obtained by the Chiche, first the covering and mellowing the Ground; and secondly, the supplying his Cattle with Food. Now both these will be best answered by the Chiche growing close. If he was to depend upon the Produce in Seed, he should not sow more than two thirds of this Quantity.

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CHAP. XVIII.

Of the Management of Chiches, and their standing for Seed.

WHETHER it be in Autumn or Spring the Chiche is sown, it requires no farther Care from the Owner. After it is once harrowed into the Ground, it will rise quickly, and shoot strongly; and being sown thick it will destroy all the Weeds that shall attempt to rise among it. In either Case therefore he is to leave the whole to Nature and wait her Progress, observing the Growth from time to time, to find when it becomes fit for being eaten: and in this he is to consider also the Condition of his Stock, and their other Provender; for he may find it profit-

able to turn in his Sheep and Lambs a Week or two before he could wish, for the Sake of the Chiches, when they would else decline for Want of proper Food.

In general the Winter Thetch or Chiche comes in much earlier than the Spring or Summer Kind, but the latter is the best and wholesomest Food for Lambs, and is what they always eat the most freely.

This does not cover the Ground so well as the larger, nor lie upon it so closely, nor yield so large a Crop of Stalks and Leaves; but still there are Advantages. We have said it is best for the smaller Cattle; and shall add what perhaps few have observed in its Favour, that it grows up much sooner after cropping than the other.

In general I have observed, that the Winter Thetch succeeds best on broad Lands, and the small or Summer Kind on Ridges. I name this the more punctually, because in this County (MIDDLESEX) the Custom is the contrary Method in most Cases. The large Thetch is best for mowing, and the smaller for eating on the Spot: and this is a farther Reason why the small should be sowed preferably on Ridges.

We have already observed what necessary Differences the Nature of Soils may make in this Article, we speak here of what is best when the Choice on that Account is indifferent.

As to the Use of Chiches we have shewn that the standing for Seed is the least, yet it is needful some Seed should be saved, and therefore tho' a lesser Article, some Care must be taken about it. In this the Farmer, as in all other Matters, should prepare in Time, by properly looking forward.

If he have sown two Fields with Chiche, that which is driest is the most proper for letting them stand for Seed; if only one, he should see which is the driest and warmest Part of it. In either Case he must set aside such a Piece as is convenient for Seed, keeping Cattle off it by fencing, or if Horses by staking them down.

This is what he is to do in the Growth, but he will find his Account in considering it at the Time of sowing.

Let him, when he orders his Field to be plowed up for this Purpose, shew the Seedsman the Spot he fixes upon for letting his Crop stand for Seed, and then order him to strew the Seed there more sparingly. Half the usual Quantity will be sufficient for this Spot, and he will get more Seed, and better than if he allowed the whole. He will soon see the Difference in the Growth of the Plants; and it will be proper to have this small Part where they are set for Seed once weeded.

These are to stand undisturbed till the Seed is thoroughly ripe in the Pods; and then are to be reaped together and threshed, after a gentle drying.

The Seed thus obtained is to be spread upon a Floor and dried. It will be advisable for the Owner to exchange this with some distant Farmer, rather than sow it again himself; but he will see by the Look and Condition of his own, when thus carefully dry'd, how the other ought to look when good.

CHAP.

C H A P. XIX.

Of the Manner of feeding with Chiches.

THE proper Part being set aside for Seed, the Farmer is to consider the rest as the Food of his Stock, and to contrive in the best Manner for the spending it among them. The Growth is to determine his Conduct, but in order to manage rightly he must always keep in Mind, that there are three Ways of using it: first, by turning in of Cattle: secondly, by cutting it green for them: and thirdly, by making it into Hay. In either Case it is a very desirable and very wholesome Food.

The Cattle are fondest of it when they eat it upon the Ground: it is the most profitable when mowed green, and given them in Racks as cut; but it is the most wholesome of all when dried. In this latter State Cattle relish it very well, and according to its Condition will prefer it to other Foods. The larger it is the coarser Hay it makes, the smaller the finer and more tender.

For this Reason the little Chiche makes the best Hay in general; but the large Kind, when not too rank, answers very well.

The Husbandman having these several Uses in Mind, will manage his Crop accordingly. He will cut it at proper Times and in proper Quantities, and will consider that the Value depends on the Age and Kind; he will therefore allow the proper Portions for feeding, and at the proper Times, and will take his Opportunities of cutting and drying some of the best and choicest of the Crop, when it is of such a Growth as will render it most agreeable to the Cattle.

In this his Consideration may extend beyond the common Consideration of the Growth. He may recollect at what Time it will be useful to give his Lambs a feeding of the fine young Shoot of the Thetch, and cut some of the best Parts of the Ground accordingly. The Plants will grow up a great deal quicker when they have been mowed, than when they have been gnawed in eating; and he will have here a Kind of second Spring, wherein there will be tender, delicate, and wholesome Food for his Lambs, at a Time when he could not have got it in the same Condition any where else; and when they would not have fed willingly upon the natural large Growth.

When the Chiches have been thus managed, during the Summer, the Owner will find he has made a very good Use of his Field in their Product and Use, but he is to know the greatest Advantage is behind; for his Land which was before in such an exhausted Condition, as to require the Refreshment of a Fallow, has all the Time it was nourishing this useful Crop been getting into Heart, and will yield him another Crop of some more profitable Kind, without farther Expence or Trouble.

The Condition and Nature of the Field is to direct him what to undertake on this Head, but he has his Choice of Wheat or Turnips in the

first Place, and if he disapprove these, of almost any other Kind.

When a good Piece of Ground has been thus covered with a full Crop of Chiches, it will, by MICHAELMAS, be so mellow and fine, that he may sow Wheat upon it with great Success.

If he chuse Turnips they may be sown with one plowing and well harrowed in, and there will be no Reason to fear an early and a profitable Crop.

We have, in a former Part of this Work, mentioned the Principal of the great Corns and Growths among which the Husbandman may, on this Occasion, take his Choice; and we shall hereafter treat of Coleseed: there are few Things more profitable than this, under good Management; and it never comes better than after a good Crop of Chiches.

The Winter Chiche we have shewn is the most profitable, because of its coming in so early for a green Food, when there is a Scarcity of other Kinds; and we have observed also, that it covers the Land the best, and does it most good; but it is proper we add an Account of what there is against it, that the Farmer may not be rash in determining for it against the other on all Occasions.

The great Disadvantage of the large or Winter Chiche, is the Uncertainty of the Crop; for it sometimes perishes altogether by Frost. 'Tis no very uncommon Thing to see a Crop of it stand through the whole Winter, and perish in FEBRUARY, or even in the first Week in MARCH by the Severity of Frosts that come after hot Days.

On the other hand, the Spring sowing is always safe; and as the severe Weather in FEBRUARY will often check those Crops of the MICHAELMAS sowing, which it does not destroy, these Spring sown ones coming up quick, and meeting with no Stop, overtake them.

There is not a better Food for the Horse than fresh mown Chiches, he will eat them freely, and they take at first the common Effect of green Food in a very kindly Manner; after which nothing puts him better in Flesh.

It is of the same Advantage in fattening of horned Cattle; and it is in a particular Manner suited to Cows, because it, at the same Time that it fattens them up, makes them yield a large Quantity of Milk, and does not give it that ill Flavour which it often gets from the feeding on some of the artificial Grasses.

The Ewes, while they feed on it, have the same Advantage, fattening themselves while they supply their Lambs with Abundance of fine and rich Milk.

The Advantages of this Pulse are not sufficiently known: it is one of those but newly got into Use, and only in some Parts of the Kingdom. We shall be happy if we can recommend it to the Farmer in such a Manner that it may become universal.

CH A P. XX.

Of Lentils.

THE Lentil is another of the small Pulse Kind, which has not been sufficiently known in the early Practice of Husbandry, nor is enough understood at present. It is a very profitable one, and we shall endeavour, for that Reason, to render it more universal.

The common Language of the Farmers in those Countries where this Pulse is most propagated, is giving it a new Name: they drop half the Word, and commonly call it the Till or Tills.

The Lentil is of the same general Kind with the Tare and Chiche, and it more agrees with this last than any other, because it has a short Pod: but this is not so blown up as that of the Chiche, nor have the Seeds that remarkable Figure we have named in those of the Chiche, by which they resemble the Head of a Ram.

The Lentil is one of the smallest of the Pulse Kind. Its Root is little and inconsiderable, and its Stalks numerous and spreading, so that it agrees with the Chiche in that it covers the Ground well, and draws very little Nourishment from it, so that it has the same Kind of Benefit in the improving of Land; but this it does in a Manner inferior to the Chiche, because it is smaller. We have shewn that the large Chiche does this much better than the small Kind; and the Lentil is inferior to both, because it is less than either, but yet it has in a proper Degree this Advantage.

The Stalks of the Lentils are a Foot and a half long and weak, the Leaves are composed of several Pairs of small ones, and are of a pale green Colour, they differ from those of the Chiche in that they have no odd one at the End; for there is a Tendril in that Part intended by Nature for the Plant's laying hold of any thing to support itself.

The Flowers of the Lentil are little, and naturally redish, but they are sometimes of a deep Purple, and sometimes white: the Pods are small, and there are usually only two Seeds in each.

The Lentil, as it is of the same Nature with the Chiche, so they serve the same Purposes. They may be eaten upon the Ground or in the Rack, and are good either green or dry. They are a very good Food for Horses, fattening them and keeping them in Health and Strength. Sometimes when eaten too greedily green they throw them into Disorders, but this may always be prevented by giving them in a proper Manner. The best Way of Horses eating them is dry. They are also good for Cows, Sheep, and Hogs; for the former in the Leaf, and for the other when in Fruit. They require no Care after they are in the Ground, and very little Charge in getting them into it, so that every thing recommends them: and we hope to see them as well known in the most remote Parts of the Kingdom soon, as they now are where Improvements are more frequent.

Numb. XXXV.

CH A P. XXI.

Of the proper Soil for Lentils, and the Manner of sowing them.

THERE is always an Advantage to the Husbandman, in having Crops that will grow upon poor Land; and this of the Lentil is one. We have seen that the Chiche will thrive upon Ground that has been exhausted by Corn; but the Lentil will succeed on such as is naturally poor, and has been exhausted into the Bargain.

The Chiche and Tare never do so well as in good Garden Mould, but the Lentil thrives upon sandy, gravelly, or chalky Soils; it is not under that Necessity of wet that the Chiche is, but will come to good where there is but the least Fund of Nourishment. In the poorest, hungriest Loams the Lentil yields a good Crop; and never fails to leave that or any other Land in a much better Condition than it was before.

The Land requires little Preparation to fit it for Lentils, and they are to be sown in Spring. As they are smaller they are also tenderer than the Chiche, and they must not be sown so early. The Middle of MARCH is as proper a Time as can be chosen for this Crop; and the End of that Month, or the Beginning of APRIL, will do very well.

We have said before that this Pulse is so small it does not well cover the Ground, for which Reason it does not answer the Purpose of enriching it like the other Kinds: it may be sown therefore with Oats or Barley; and will thus answer different Purposes. Oats and Lentils will grow very well together; and as they will be ripe about the same Time, they may be reaped together, and threshed together, after which they will very easily be separated by throwing: the Oats being lighter will fly farthest, and the Lentils from their Weight, and their smooth round Form, which the Air lays no Hold of, will drop by the Way.

When they are sown with Barley they may be separated in the same Manner; and if a little Care be taken in the throwing, there will be very little farther Trouble.

The Seed Lentils should be plump, smooth, and shining, for this shews they are fresh and sound: and the Farmer will do well always to exchange Seed with some other at a Distance, who occupies a somewhat different Kind of Land. This being to the mutual Advantage of both there never is any Difficulty. According to the Service for which the Lentil is intended, a different Manner of sowing will be proper. It is very useful to be eaten in the Stalk, but it is also worth Regard as to the Seed. In this it is greatly preferable to the Chiche, because the Pods are vastly more numerous, and the Seeds are not only produced in greater Quantity, but are much more valuable.

The covering of the Ground being less a Consideration in this Respect, gives a new Method of Culture at the Farmer's Discretion for this Species, that is, by the Drill and Horsehoeing Method.

Method. The Lentil will thrive excellently on the poorest Ground under this Management; but that is not a Reason why it should always be preferred; on the contrary, we shall advise the Farmer, on some Occasions, to prefer the other.

Before he sows his Ground with this Pulse, let him consider what is the principal Use whereto he intends to put it. If he design it for eating, whether fresh or dry, whether on the Ground or in the Rack, let him by all Means sow it in the common Way, just as we have directed with Respect to Chiches; but if he have his Eye principally on the Seed, let him by all Means sow it by the Drill, and in such Manner that it may be horsehoed.

This naturally infers a great Difference, with Respect to the Quantity of Seed.

When Lentils are sown for feeding in the common Way of Husbandry, the proper Quantity of Seed is a Bushel and half to an Acre: if it be intended for Seed, and sown by the Drill, three Pecks is a very sufficient Quantity, and the Plants will yield more than if twice as much Seed had been used.

In this Case the best Time for sowing them is the third Week in MARCH, and they should be sown in double Rows, with about eight Inches between them, and with such Intervals between Row and Row, that the Horsehoe may conveniently come in.

In this Case the Produce will be very great; and this is the best Way of sowing them on poor Land.

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#### C H A P. XXII.

##### *Of the Management and Use of Lentils.*

**T**HE Lentil, as sown in the common and Drill Way, requires to be spoken of distinctly. If it be sown by Hand, nothing is needful to be done, for it will rise thick and destroy all the Weeds that attempt to rise among it. When it is sown by Drill, the Horsehoe must go once through the Middle of each Interval, when the first Shoot of the Weeds is up; and then no more Trouble is necessary. In this latter Case, as they are to grow for Seed, no more need be added, but that they are to stand till ripe, and then to be reaped dried, by lying in little Heaps in the Field, and then threshed. But in the other Manner more is to be said about them.

If they be sown in the common Way, with Oats or Barley, they must stand their Time, and take their Chance with it; and when ripe must be thrashed together and separated, as we have shewn: but when they are sowed alone, in the common Way of Husbandry, there requires Care and Conduct in the Management of them.

Some in this Case are to be left to stand for Seed, but the greater Part is to be eaten upon the Ground, or mowed for that Purpose.

Lentils will not grow up after cutting or eating, so free as the Chicke, but they afford a good Supply at the cutting. For all Purposes the

cutting and drying is the best Method. The Ox, Cow, and Horse are very fond of the Lentil cut and dried, and it nourishes them greatly, but there is to be a Time observed for the cutting, according to the Beast that is to be fed with it.

The best Time for cutting it for Oxen and Cows, is when the Pods begin to fill; but for Horses it is best when the Lentils are nearly ripe in the Pods. It must not be let to stand till they are quite ripe, for then the Stalk and Leaves lose a great deal of their strengthening Quality; but just when the Seed is large, and they are not decayed, the Lentil serves them both as Hay and Corn.

The Seed is not unworthy the Notice of the Farmer, with Respect to his Family, for it is very wholesome, and not at all unpleasant.

When Lentils and Barley have grown together, they may be ground together, and will make a very wholesome and pleasant Kind of Bread; and being boiled in the Manner of Pease, they are eatable, and in the Opinion of many pleasanter than the best Pease. They are excellent eaten in the Straw, to make Cows give Abundance of Milk, and they give it no ill Taste; and there is no Plant whatsoever that better assists the Ewe for the Suckling of her Lambs.

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C H A P. XXIII.

Of Buck-wheat.

AT the End of this Account of the Farmer's lesser Crops, of these several Kinds, we shall add one of a singular Nature, and then close the present Book, this is Buck-wheat, called in some Places Brank; it is very different in Kind from the several Plants before-named, but it is cultivated in the same Manner as an Herb that may yield some Profit; and at the same Time improves the Ground whereon it grows.

Buck-wheat is an upright and pretty Plant, it grows a Yard high, and has a stiff, firm, and round Stalk, which divides toward the Top into several Branches. The Leaves are broad, they are forked at the End next the Stalk, and pointed at the other, and they are of a pale Green, often yellowish. The Flowers stand on the Tops of the Branches in large Tufts; they are small and white, and the Seeds follow, which is of a triangular Shape, large and brown on the Outside, but with a white Kernel within. Each Flower of the Buck-wheat consists of one white little Leaf, divided into five Parts, and has no Cup. Among the Writers on Botany, several have called this a Cup, and said that the Buck-wheat has no Flower properly so called. Within this are eight little redish Lumps, which contain a sweet Juice, such as there is in most Flowers, in greater or lesser Quantity. These form what is called the Nectarium of the Flower. In the Centre there grow eight slender Threads, of the Length of the Flower, with little Buttons at their Ends; among these stands the Rudiment of the Seed: this is of a three square Form, and has three thready Substances growing to it, which are tufted at the Ends: these serve to catch the Dust from the little Buttons, on the Tops of the other

other Threads for the ripening of the Seed. One Seed follows every Flower, and the Flower itself serves it as a Covering, growing dry without falling, and clinging round it. This is one Reason why it has been called a Cup, rather than a Flower. The Cups of Plants frequently remaining with the Seeds, but the Flowers not.

It is a Native of the East, and is used in some Parts of the World for making of Bread. It is called by Writers on these Subjects Fagopyrum, and sometimes Trionum. We meet with this last Name in some Books of Husbandry, but the Authors have a very good Reason for saying little about it, for they do not seem to understand the Meaning of the Word.

There are two Uses in the sowing of this Crop, the one that its Seed is of some Value, the other that it will serve as a Manure; or as the Farmer's express it, a Lay, whereon to sow Wheat or Rye; but in this Case there is a particular Method to be used, for nothing is so advantageous, as the plowing it in entire at a proper Growth.

CHAP. XXIV.

Of the Soil for Buck-wheat, and the Manner of sowing it.

Buck-wheat will grow on the most barren Lands, and this is one of its great Uses to the Farmer. The dryest and worst will afford it Nourishment. If he have a Piece of almost heathy Land, or of naked Gravel, or in the Stone Countries, one of those Lands where Chips and Fragments of Stone make up, in a Manner, the whole Surface, Buck-wheat will grow on any of them. It requires little Preparation, and needs not be sown till very late; so that every Way it recommends itself to his Regard.

When he has fixed upon a Piece of Ground, so poor that it will bear nothing else; or one that may, by this Means, be rendered fit for something better, his next Thing is to seek for good Seed.

He is to chuse the fairest and soundest he can get, such as is dry and of a bright Colour is best; but this is in general a Seed in which there is less Hazard than most others.

The Quantity is to be very different, according to the Design of sowing; for when Buck-wheat is raised for Seed, a small Number of Plants well nourished is what the Farmer is to desire; but when it is sown only to be plowed in as a Manure, the Seed being not at all concerned in this Matter, the larger a Quantity there is upon the Ground the better.

When Buck-wheat is raised for the Seed a Bushel is sufficient for an Acre; but on the other hand, when it is meant by Way of Preparation for another Crop, four Bushels to the Acre is not at all too much. The Time of sowing Buck-wheat as already observed, is later than that of almost any other Crop. The Beginning of May is the earliest it should be put into the Ground: the Middle of that Month is a better Time, and it will do to the very latter End. Buck-wheat

being a Native of very warm Climates, does not bear Cold, and it is so quick a Grower that it needs not be sown early in the Season; for when got into the Ground toward the End of May, it will very well ripen during the Summer Season.

After Buck-wheat is in the Ground there requires no particular Care to be taken of it. The common and familiar Method of plowing and harrowing, and that in the lightest Manner, covers it, and it will shoot at its own Time, let the Weather be what it will: Rain or dry makes very little Difference.

When once cut up it grows apace. The Sort of Grounds allowed to it does not favour the Growth of Weeds, like richer Land, nor do they grow so quick upon it; so that the Buck-wheat thriving apace, quickly gets the better of them. In this Condition it will continue growing up till it comes to flowering, unless the Intent of the Farmer be to plow it in sooner.

CHAP. XXV.

Of the Management and Use of Buck-wheat.

Beside the two Uses of Buck-wheat in the Seed, and in plowing into the Ground, it has another very considerable one, which is, the being eaten by Cattle. This is the more important, because it comes in at a Time when other Provender is scarce, the Grass being burnt up by the Heat; and the horned Cattle at this Time, toward the End of Summer, being generally in great Want of good fresh Food. The Buck-wheat being then just coming into Blossom, the Cows are very fond of it; and it is an excellent Nourishment, rich and wholesome, making them yield a great Quantity of Milk, and not giving it any disagreeable Taste. There is no better Butter or Cheese than such as is made of their Milk when they have fed in this Manner.

If the Farmer intends his Crop for this Use, he must sow it thicker than for Seed, but not so thick as when he intends it for plowing in; two Bushels and a half of Seed to an Acre will yield a very good Growth for this Purpose.

After the Cows have eaten it down, the Stubble may be plowed in, and the Land will do very well for a Crop of Rye. It is not so well as when the large full grown Crop, sown for that Purpose, is plowed in entire, that being the best Method of making this Crop proper for Wheat.

When this has been the Intent of sowing, the Crop is to stand till full grown and in Flower, but not till the Seed is formed. Just before that it is in the richest Condition for Manure, and that Opportunity is to be taken.

When the Seed is the Point in View, and the Field has been sown sparingly for that Purpose, the Plants will be much stronger, and they will ripen a great deal.

At this Time the Farmer is to watch when most is ripe and none fallen, and then he is to get in his Harvest.

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Buck-wheat may stand longer than almost any Kind of Crop for this Purpose; for none holds the Seed so firmly. But still there is to be some Regard to the Ripeness; and when but little is left that can come to good, the whole is to be cut, that more than its Value be not lost in waiting for it.

The Way of gathering it is by mowing; and when down it is to lie some Days in the Air before it is housed; there is no great Danger of Accidents during this Time, for scarce any thing is so hardy. When the Stalks are grown limber, and the Grain firm, it is to be carried in and thrashed. The Produce is very great. Fifty Bushels for an Acre may be had from very moderate Land, and much

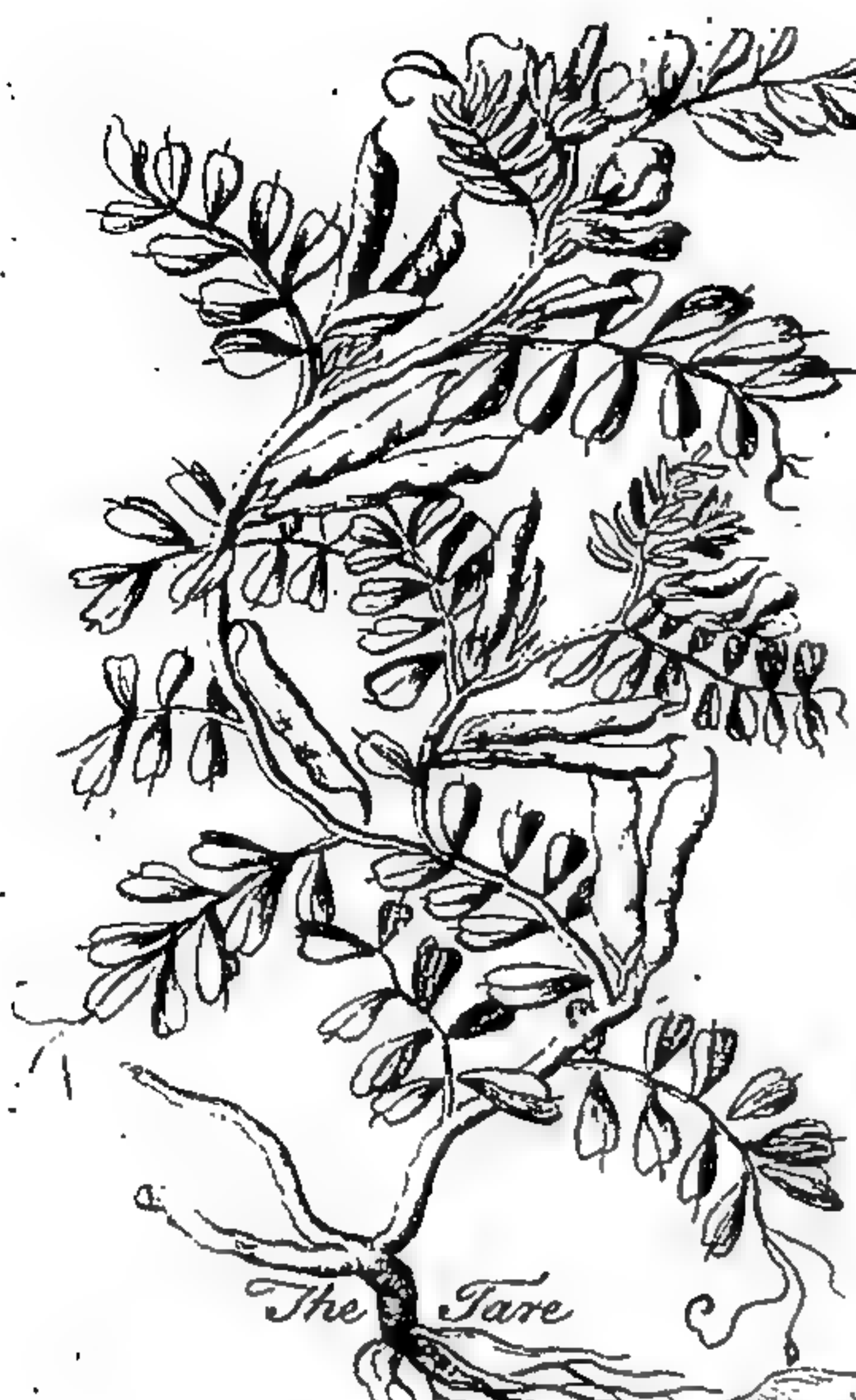
more is common from such as is any thing rich.

The Uses of the Seed are many, it serves excellently for Hogs, who are fond of it and fatten very well upon it: many Kinds of Poultry also like it; and in some Countries it is eaten by the poorer People, made into a Kind of Pancake, with some Wheat Flower among it. It is a thriving Food for Horses. But it should be broke in a Mill before they have it, otherwise the Skin is so tough it passes through them without doing them any good. Cattle will also eat the Straw, but it is not nearly so nourishing as the Grain.

End of the SIXTH BOOK.



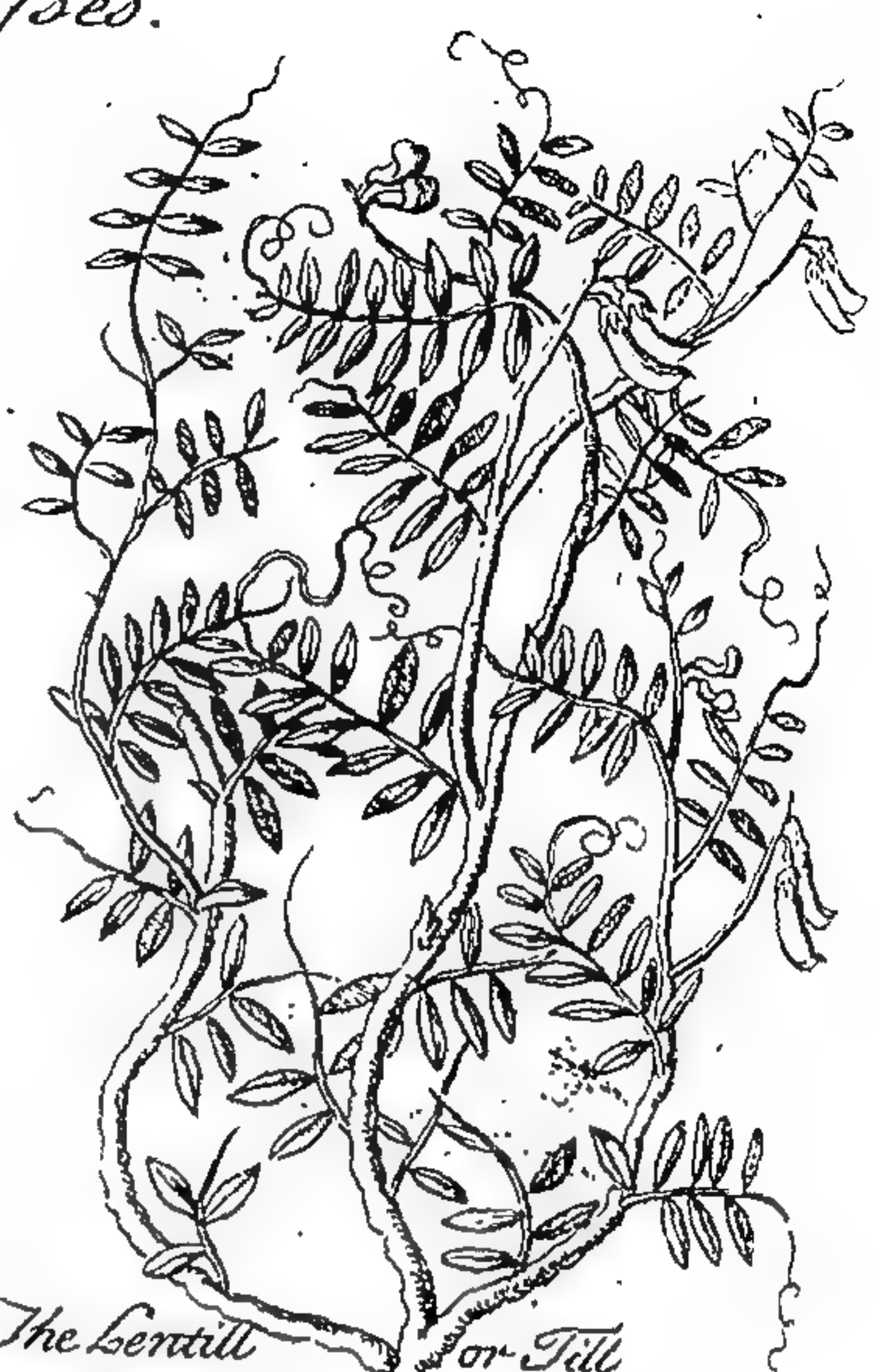
Pulses and Artificial Grasses.



The Fava



The Chick or Thetch



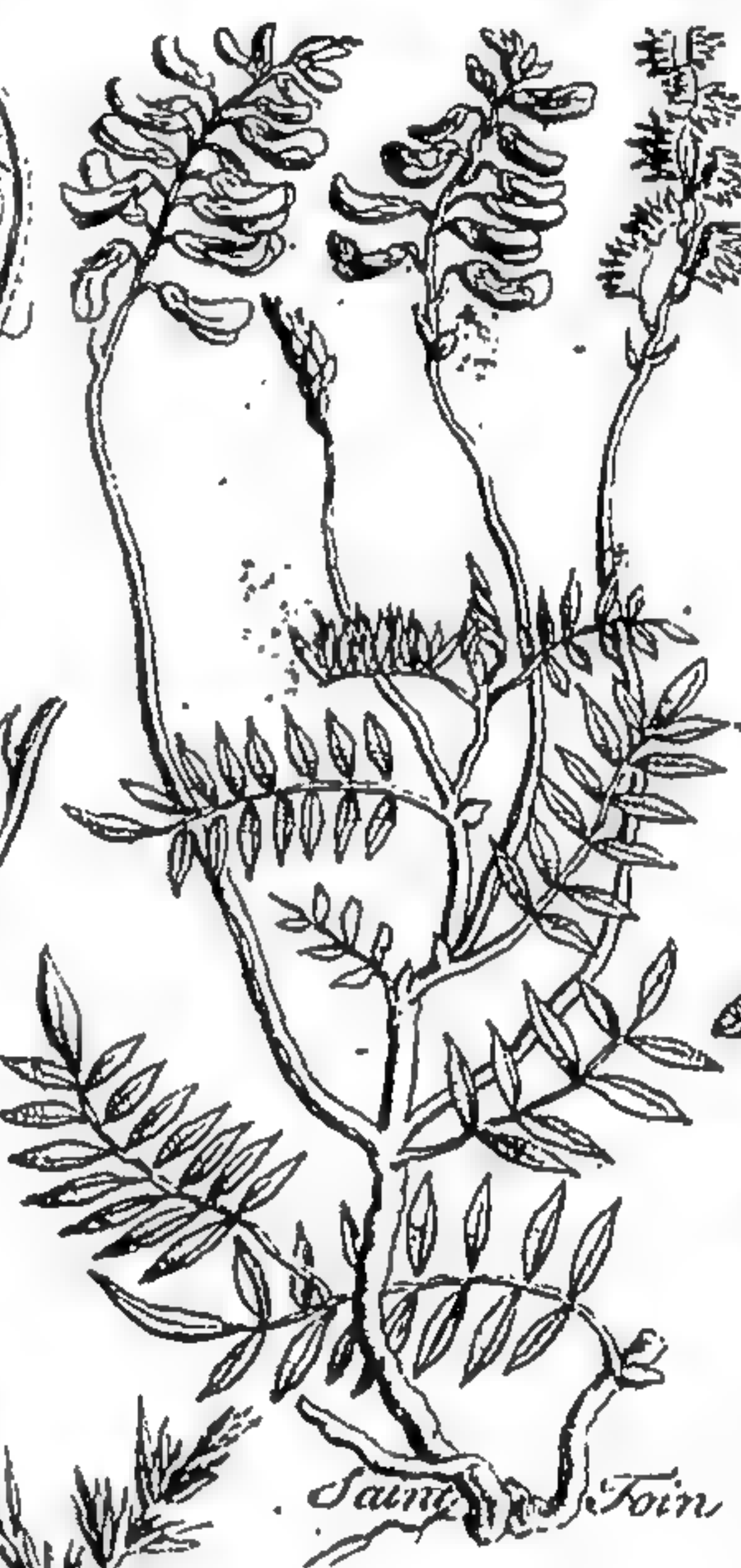
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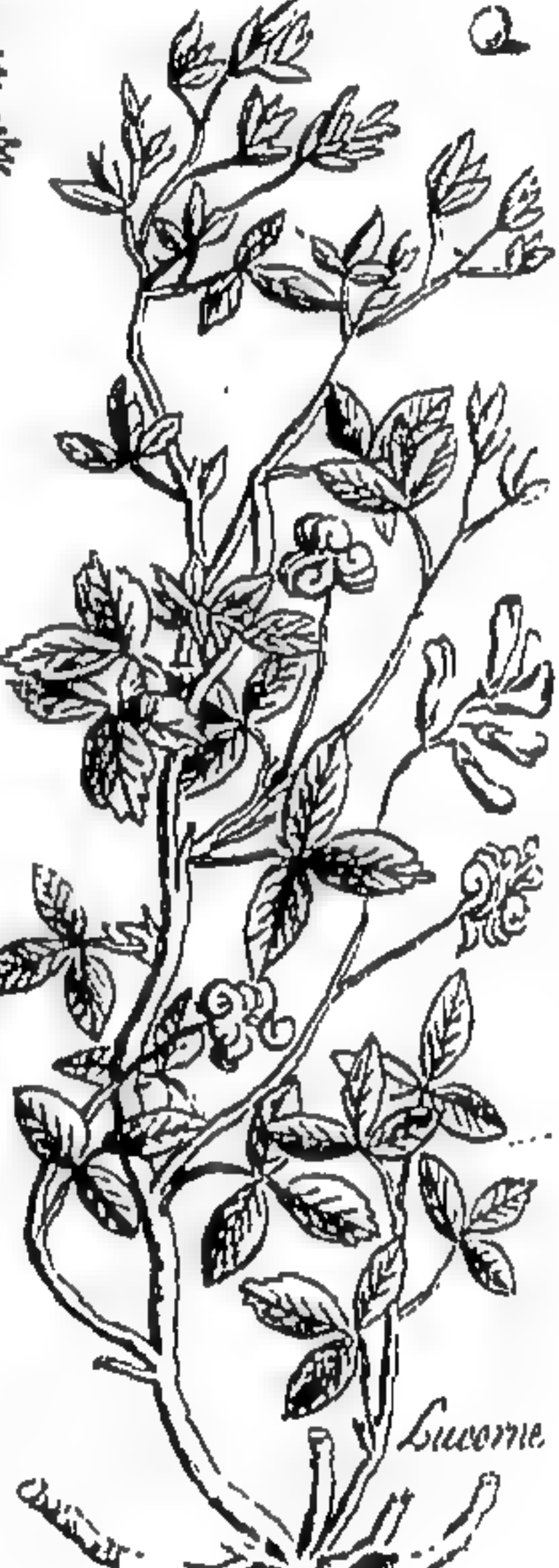
Buck Wheat



Clover



Saint Foyn



Lucerne



Hop

Trefoil

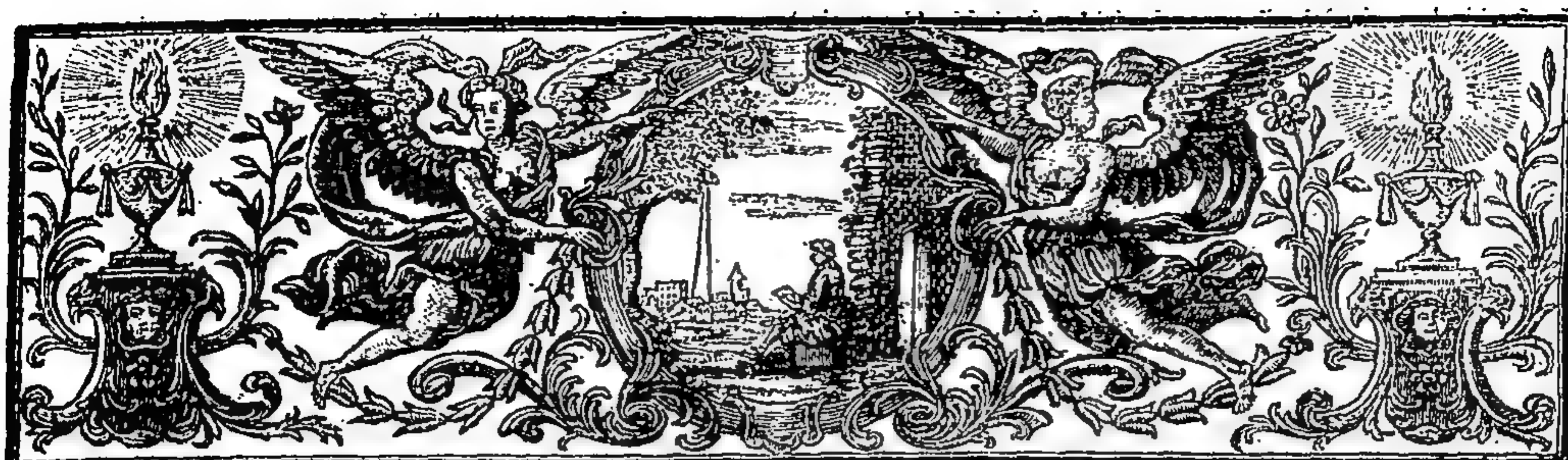


Ray

Grass



Spurry



A
COMPLEAT BODY
OF
HUSBANDRY.

BOOK VII.

Of NATURAL *and* ARTIFICIAL GRASSES.

In TWO PARTS.

CHAP. PART I.

1. *Of the Division of natural Grasses into Meadow and Pasture.*
2. *Of Grass Grounds that lie high.*
3. *Of Grass Grounds lying low.*
4. *Of Accidents to which Grass Grounds are liable.*
5. *Of clearing a Grass Ground from Ant-hills and Mole-hills.*
6. *Of clearing a Grass Ground from Stumps and Bushes.*
7. *Of improving mossy Pasture Ground by burning.*
8. *Of improving common Grass Ground by Manures.*
9. *Of the general Management of Grass Ground.*
10. *Of Mowing.*
11. *Of Haymaking.*
12. *Of the Aftermath and Winter Use of Grass Grounds.*

CHAP. PART II.

13. *Of the artificial Grasses in general.*
14. *Of the best Soils for Clover, and the Manner of sowing it.*
15. *Of seeding upon Clover.*
16. *Of mowing Clover, and its Hay.*
17. *Of the Soil for Saintfoine, and its Preparation.*
18. *Of sowing Saintfoine, and managing it while on the Ground.*
19. *Of mowing Saintfoine, and the Uses of its Hay.*
20. *Of Lucerne, its Soil, and Manner of sowing.*
21. *Of preparing the Soil for Lucerne.*
22. *Of the Manner of sowing Lucerne.*
23. *Of the Value of Lucerne, and the Manner of using it.*
24. *Of Hop Trefoil.*
25. *Of Ray Grass.*
26. *Of Spurry.*

The INTRODUCTION.

THE natural Division of the Farm is into Pasture and Tillage, the first concerns Grass, and the other the various Species of Things sown after Plowing: but though this be generally last named, it is by much the most important, wherefore we have begun with it, and having in the six preceding Books gone through the Consideration of the Soil, and of its Management various Ways for that Purpose, together with the Methods of raising the best Crops of the several usual Kinds; we now come to the

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other Part which concerns the Grasses; and after having gone through these, which make the second great Consideration of the Husbandman, we shall deliver the Culture of those Roots which fall in his Way, and of several Crops of a less general Sort.

In treating of the Grasses, we are led into the Consideration of two very distinct Kinds, tho' from their Use blended together, these are the Grass which naturally rises in the Meadow and Pasture; and those Plants which are sown in Fields, though from the Purposes they serve, they are called by the same Name.

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The first Kind may be comprehended under one Term, for its Differences are not great; the other comprehends several Kinds, Clover, Saintfoine, Lucerne, and others.

The Curious reckon two or three hundred Species or Kinds of common Grass, but this is a Distinction the Husbandman needs not regard. He will see some rank and some fine, and will distinguish the Grass of the low Meadow from that of the up-land Pasture, and both from the short Bite of the Down; and this is all he needs regard.

These several Species taken together, make what we call common Grass, or natural Grass: the others are called artificial Grasses, a Term we shall use in Compliance with Custom, tho' not the most judicious that might have been chosen.

The natural Grass is the Produce of our own Country, the Growth of wild Nature, and we have it finer than any other Kingdom in the World: the others are principally of foreign Original; and most of them have but newly been brought into Use with us.

Natural Grass will rise of itself, the Wind scattering its little Seeds every where, and it is the Covering of our Meadows rising without Art, or our Assistance: the artificial Grasses are to be raised by Culture. Land is to be plowed for them as for Crops of Corn, and they are to be sown with as much Care and Regularity; but, with proper Management, they answer the Expence with a very large Return.

We shall in that Part of the succeeding Book, which treats of the several Kinds of these, lay before the Farmer the Practice of the most ingenious, and most successful in different Places on this Head; and add many Remarks that have not been before made Publick, relating to the Culture of one or two particular Kinds; for there is no Part of the Husbandman's Profession that more needs to be illustrated and explained: but we shall lead the Way to this by treating of the common or natural Grasses first, with which every one is acquainted, and where-with every Farmer must have a great deal of Concern.

BOOK VII. PART I.

Of Natural Grasses.

CHAP. I.

Of the Division of natural Grass into Meadow and Pasture.

THE Farmer in his Conversation, and Writers in their Books, divide the natural Grass Grounds into two Kinds, not as differing in the Species, but in the Place of Growth, and the intended Use. These they distinguish by the Names of Meadow and Pasture, and generally understand by that Distinction, the Grass intended to be cut for Hay, and that to be eaten on the Ground, but this is an uncertain Manner of speaking. By Meadow some express the Grass of low Grounds only, that lie about Rivers; and by Pasture only such as grows on higher Lands; but both these are by the judicious Farmer mowed at Times, and fed at Times, so that all that is properly to be understood by the two Words is, that being used together, they express that Part of the Farmer's Land which is not in Tillage, and they should be used together, because this Variation comprehends all Grass Ground whatsoever, in Distinction from all that which is kept in Tillage.

It is a Matter of great Importance to the Farmer, to proportion these two Kinds of Ground, the Tillage and Pasture, one to another. There are many who call themselves Farmers near London, and about other great Towns, who deal altogether in Pasture; and this they may do without any Necessity of Tillage; but there is no such Thing a Man's keeping his Farm all in Tillage, without Pasture. His Cattle must have Food, and his Fields for Corn

in the common Way of Husbandry, require a great deal of Dung for Manure.

This brings on the Necessity of keeping up a Proportion between one Kind and the other, for which there is no laying down any general Rule; because, according to the Nature of his Land, and the particular Course of Husbandry he follows, more or less Dung may be wanting.

His Experience alone must shew him this, but he will find it easy to make Alterations where it is necessary: the laying down a Piece of Corn Land for Grass, and the taking up a Piece of Grass Ground for Tillage, being, as we have shewn, very easy.

There are particular Estates also that answer best in various Manners. There are some that are so rich and proper for Corn, and that lie so conveniently for Dung, that a much greater Proportion than the common Method may be kept conveniently and profitably in Tillage; and there are others naturally favourable to Grass, and that lie where there is a great Demand for it; and in these the greater Part should be kept for Pasture.

As we have shewn that the Distinction into Meadow and Pasture is very little settled in its Meaning, we shall, to be the better understood by all, speak in general of both under the Name of Grass Ground. The Hay from Grass Grounds that lie low, and are what is most properly called Meadows is generally in *larger* Quantity than that from such as are higher; but this latter, though there is less of it, is sweeter.

The Abundance of Water that often gets into,
or

or upon these low Grounds, makes the Grass rank: and where they lie in the Way of constant Wet, they naturally produce very coarse Kinds of it. We see Rushes grow in barren and wet Places, and there are a great many Kinds of Grass, tho' not enough regarded, that more or less approach to the rushy Kind, which greatly diminish the Value of the Hay, that comes from the wetter Sort of these Grounds.

The Grass Grounds that lie high require Assurances from Manure, but those which are lower, and in the way of flooding, do not; the Overflowing of every River so far imitates that of the Nile, that it always leaves a Mud behind it, which serves in the Place of Manure, and makes the Grass spring fresh, as if Art had been used to recruit the Strength of the Ground.

We have named two Kinds of Grass Grounds, but there is a third yet to be mentioned, which is such as are within the Reach of Salt Water, whether by the Sides of Rivers, near the Sea, or of the Sea itself. These are a great Quantity in one Part or other of the Kingdom, and are capable of being turned to very good Account; their Management therefore is a material Consideration in a Work intended for general Use.

Having premised thus much concerning the Nature and Distinctions of Grass Ground in ENGLAND, we shall first consider the three Sorts separately, and afterwards the general and particular Methods of procuring the richest Produce from each.



CHAP. II.

Of Grass Grounds that lie high.

THESE are what the Farmer generally expresses by the Term up-land Grass Grounds; some by way of Distinction from the lower, call them Pastures, the other having the Name of Meadow. These up-land Grass Grounds differ in Situation as they lie upon higher or lower Risings, or upon their Tops or Sides; they also vary greatly in their Soil, which, tho' it be in general different from that of Meadows, yet is also very various in Kind between one up-land Ground and another.

With Respect to their particular Situation, we must first observe, That as a certain Degree of Exposure is proper for Grass, so there may be too much; and therefore that those Risings which are of a moderate Height, are better for Grass than such as come under the Denomination of high Hills.

The next Difference is, That of their lying on the Top, or on the Side of a Hill; and this is so great, that it often trebles the Value in one above the other: nothing is more frequent than for Ground to be wet and boggy on the Top of a Hill, while it is perfectly fine on the Sides all the Way down.

Springs naturally rise on Hills, and when they are pent in, they break and soak through the very Substance of the Ground, and convert the whole upper Part of the Surface into a Bog.

On the contrary, the Side of a rising Ground that has a gradual Descent, is, of all Situations that can be named, the best for Grass. In such Ground there generally is Moisture at the Bottom, which is very essential to Grass; and there is a Way for it to run off, which is equally necessary.

Grass will not thrive without Water, nor can it be good where there is too much; this is the great Article. Where the Tops of Hills that are any Thing high have no Spring, the Bleakness of the Exposure, and the Poorness of the Soil, as that is commonly the Case, render the Grass very weak: it is sweet, but very little of it; and where there are Springs, it is generally boggy. The Way of getting off the Water we have delivered in a preceding Part of this Work, where we treated of Draining; we here speak of the natural Condition.

Now the Side of a Hill having Soil and Moisture, feeds a rich and good Grass, without having so much wet as to make it rank, or favour the Growth of Rushes, or those other bad Kinds of Mixture, which generally depreciate that which grows on the Tops of Hills, or near Rivers.

As to that in Meadows, lying low, is generally a black rich Mould; and nothing more favours the Growth of fine Grass; but then what these Grounds gain in Soil, they lose by the abundant Moisture.

The up-land Pasture, of which we treat here, have all that Variety of Soils we see in tilled Ground; they are sometimes gravelly, sometimes loamy, at others they are stony, chalky, or clayey. Of all these, the loamy Soil, where there is a good Proportion of rich Earth amongst it, yields the best Grass; upon Clay, it is apt to be coarse, because of the Wet it detains; upon Chalk, it is low; upon Gravel, it is sweet, but thin; the Loam, when of the right Condition, yields it just in the middle Way between all these, it is plentiful yet sweet, and affords the finest Hay, and the sweetest and richest Food for Cattle.

This will direct the Farmer, when he is about to make Changes in the Proportion of his Tillage and Pasture, what to keep for Grass, and what to break up.

The several other Soils will afford good Corn by proper Management, and they are easily dressed when in Tillage; but nothing will answer so well in Grass Ground, as the Soil and Situation we have named.

It may be often adviseable to break up a Piece of Grass Ground that is on a clayey Soil, because the Clay may be improved by the Additions of Sand with great Ease, while in Tillage; but it is not well capable of this while in Pasture. The same may be said of the others: they may be easily made to yield as good Crops of Corn as the Loam, but nothing in this Situation will afford so sweet Grass.

I have observed in LINCOLNSHIRE, that their rising Grounds have often a Soil exactly like that of their low Meadows, a black rich Earth; but, on examining, there is always too much wet at the Bottom; their Grass is, however, much finer than that of the low Grounds. In many

many Counties also I have observed, the Tops of Hills, in general, dry, and their Sides moist: in this Case the Rule is to be inverted; and it is the Tops that bear the sweetest Grass.

A Soil that is too clayey, is liable to great Inconveniencies with respect to Grass: in Winter it detains the Wet a long Time, and in Summer it cracks and chaps, and no Earth is more perfectly burnt up.

The black Mould, such as is in the low Grounds, yields Abundance of fine Grass when it lies dry on the Side of a Hill, but then it is commonly infested in a terrible Manner with Worms: the loamy Soils are less subject to them, and are therefore preferable; so that on all Accounts that Preference is due to the rich Loams, which we have given them in Respect to the Growth of Grass: they are not subject to poach in Winter, nor to crack or be burnt up in Summer.

Thus let the Farmer judge of the Fitness of his Soil for his various Purposes, and taking in the whole of the Consideration, with Respect to Grass, he will now know that a Piece of hanging or slanting Ground, with a loamy rich Soil, and a moist, but not wet Bottom, is the best and fittest of all for Pasture; and if he can contrive to bring the Water of some Spring occasionally over it, nothing can add to the Advantage; for such a Piece of Ground, where Water can be let on at Pleasure, and where it will not lodge, is the most suited by Nature for Grass of all others. Such a Piece of Grass Ground as this will require Manure at Times, but it will very well answer the Charge, by the Quantity of the Hay, and Richness of the Grass afterwards, for it will always retain its natural Sweetness. The poorer the Soil the oftener these up-land Grass Grounds will require Refreshment, but, in the worst of them, this is an Expence always returned with Interest.

The Manner of enriching these Lands by Manures is a separate Article, and we shall treat of it in a succeeding Chapter.

CHAP. III.

Of Grass Grounds that lie low.

THESE comprehend what are commonly called Meadows, Fen, and Marsh Lands. All low Ground is subject to overflowing, either in a larger Way by Rivers, or in a smaller by the Water coming from the higher Grounds in the Winter Rains; and both these Wettings are of great Benefit, if proper Care be taken to carry off the redundant Water; and to prevent the Overflowing by Rivers at improper Times.

The finest Part of the Mould is washed off by Rains from plowed Lands that lie high; and a Part of the Manure with it, and carried down with the Water to the low Grass Grounds at their Bottom, this it is that renders them so fruitful; and in the same Manner Land Floods drowning Meadows by River Sides, have the same Effect. The Waters of these are thick and yellow, with the richest Part of the Soil from the adjoining high Grounds, and they

leave this upon those Meadows when they lie upon them to settle, and are then taken off. This renders the Grass on these Grounds very plentiful, but as there generally remains too much of the Moisture behind, it is coarse; there grow Weeds, and ill Kinds of Grass in them, which are not in the sweet Pasture of the uplands. There is a great deal of Difference in the Value of those Meadows which are liable to be overflowed by Accident, and those which are capable of being overflowed at Pleasure, but are out of that Danger. In the first, the Water may come at a wrong Time, and often does so to the utter Loss of the Crop: but, in the other, it never can come but when it is brought, and yet 'tis at all those Times, when proper, ready at the Husbandman's Command.

Such Meadows as lie flat on the Banks of great Rivers, are of the first Kind: these are subject to accidental Floodings, which may come at very wrong Times, and are therefore very precarious and uncertain as to the Produce.

Those which lie near lesser Streams, and a little higher than the Level of their Waters, are of the latter Kind, they may be overflowed when it will do them good by turning the Stream of the Water upon them; and these are worth much more than other low Grass Grounds for this Reason; as the others, from their hazardous Situation, are worthless.

To those two we may add a third Kind of Grass Grounds, which are of a Kind of middle Nature between these, and the up-land Pastures. These last are such as lie above the Level of the Water considerably, yet not so much but that it may be brought over them by Means of Wheels or Engines: these are expensive, but the Benefit is very great. We have not the Spirit of the ITALIANS in this Respect, nor indeed the Necessity: they raise Water to a surprizing Height for the overflowing their Pastures; and they owe all their Verdure to that artificial Management.

The Meadows that lie on the Sides of large Rivers, have all the same general Soil, which is a rich dark Mould, they yield Abundance of Grass; and they owe their Fertility to the Overflowings of those Rivers.

Where they can be so managed that the Water can be kept out at proper Times, they are very valuable. This we have treated of in a former Part of this Work; but they can rarely be secured.

When Grass Grounds lie near the Borders of great Rivers, but so high as not be flooded accidentally, it will always be worth the Farmer's while to have an Engine for overflowing them at such Times as he shall think proper.

A very great Quantity of the Grass Ground in LINCOLNSHIRE, and some other Counties, is what they call Fen Land. This is of the Nature of these flat Grounds, which lie near great Rivers, and are subject to accidental Overflowings, but they are of the worst Kind, being liable to receive vast Quantities of Water, and often having also Resources of their own beside. These we have spoken of in a former Part of our Work, treating of the Manner of banking and draining them;

them; as also of the third Kind, which are the Salt Marshes: these are in themselves poor, and full of the worst Sorts of Weeds, but by Draining and Banking, as we have there shewn, they become excellent Pastures.

These are the several Kinds, which, having thus laid before the Reader in one View, we shall, in the ensuing Chapters, consider with Respect to their Improvement, and most beneficial Management.

CHAP. IV.

Of the Accidents to which Grass Grounds are liable.

WE have shewn what is to be expected from each Kind of Grass Ground, with respect to its Soil, its Situation, and its Degree of Moisture: we now come to consider those Accidents to which all Grass Grounds are liable, and which reduce their Value. These are of three principal Kinds, the first being from Weeds, the second from Rubbish of any Sort, left on the Ground, and the third from Ant-hills and Mole-hills: these last are the most difficult to be removed, but when Mowing is considered, they are of all other Annoyances the most obnoxious.

Weeds are of various Kinds, and hurtful in different Degrees. All Plants, not of the Grass Kind, may be called by this Name; when among Grass, but some are beneficial: the white Trefoil, which is a Sort of Clover; and the red Trefoil, which is a wild Clover, are both serviceable, and so are several other little Plants that rise spontaneously among the Grass.

The large Weeds are most troublesome, such as Thistles, Docks and Mallows. These are to be grubbed up, or drawn with an Instrument made for that Purpose, called the Thistle Hook. This pierces into the Ground; and laying hold of them at some Depth, easily pulls the whole Root up.

As to accidental Rubbish, this must always be picked off. Some will be thrown on by Carelessness, and some comes on among the Manure; which, though not so easily seen at first, is very plainly to be perceived when the Rains have washed the rich Part of the Dung into the Ground.

Women or Boys may be sent in to gather up this Sort of Stuff, which consists of Bones, Bits of Brick, and broken Glass; a little Trouble takes it off, and saves a great deal of Difficulty to the Mower.

CHAP. V.

Of Ant-hills and Mole-hills.

THE Weeds being drawn, and Rubbish picked off, the Ground will remain in a Condition for the Scythe, if there be not Ants or Moles about it; but these Creatures will raise Hills that will greatly obstruct the Business, and that must be removed.

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There are some who pretend, that in feeding Grounds these Hills are of Service, at least not of any Damage, but they err in every Respect: there never was an Ant-hill that did not occasion some Mischief, and where there is one there will soon be more, for the Ants will spread in a little Time over a large Spot of Ground.

The Loss by them is evident, because they will cover a great deal of Ground; and they bear but a poor Quantity of Grass. They not only increase in Number, but in Size, when let alone, and some have them cut up at last that would half fill a Cart. They make the Ground disagreeable to the Eye, and very unpleasing to Cattle that feed on it, and have all these Inconveniencies yearly increasing. The prudent Husbandman weighing this whole Matter, will not follow the Example of those, whose Lazyness or Ignorance suffer them to stand, but will resolve to extirpate them at once, the sooner he sets about it the less is the Expence; and tho' it grow greater as these Hills are more numerous or large, he should not be disheartened by that, but assure himself, that the Advantage will be many Times greater than the Charge.

There are several Methods of destroying these Hills, and we shall give the Husbandman his Choice of them; but when there is any Quantity of this Work to be done, he will find the Plow we shall recommend for that Purpose, vastly the best.

Some order their Servants into the Grass Grounds in Spring, to cut up these Hills by Hand; and where there are not many of them, this may answer: it is to be done thus. A thin Shovel is to be made for the Purpose, and well edged with Iron; with this the Workman is first to cut down through the Ant-hill, beginning at its Top, and pressing the Shovel down with his Foot: he is then to draw it out, and make another cross Cut: this separates the Turf and upper Part of the Hill into four Quarters, then are to be thrown back, and then the Earth underneath is to be dug up with the Nest of the Ants among it. This being done, the four Quarters of the Turf are to be thrown together again, and they will soon close and grow.

This is now a Method in some Places, and was at one Time practised universally; but the Disadvantages attending it are plain: in the first Place, here is a disagreeable Hollow left in the Ground; and then, doubtless, some of the Ants will remain in the Turf; and having so good an Opportunity, they will soon multiply, and get to work again; and the Hill will be as big as ever in a little Time: for they are covered by the Turf from the two Accidents most pernicious to them, Birds, and severe Weather.

But there is another Consideration behind; which is, the Body of the Ants, with the Earth taken out of the Hole. How to dispose of these is no little Difficulty. The old Custom was to break the Clod to Pieces, and spread it over the Surface of the Pasture; but this was not destroying the Ants, it was only dispersing them: there was nothing to prevent their getting together again, and accordingly they soon did so, and the Field was over-run with them.

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At present the Farmers about LONDON dig them out, and carry them off to their Dung-hills, where some are destroyed, but some remain alive, enough to renew the Mischief. These Hills mix among the Dung, and they are carried with it again upon the Ground, where they breed, multiply, and renew the Mischief.

One wonders that People who found so much Inconveniencies from these little Insects, could content themselves with such imperfect Methods of remedying it; but such were the best known for a long Time, and such are in many Places the only Ways yet used.

There cannot be too much Care in the utterly extirpating these Creatures, nor in a proper Method of setting about it can there be any Difficulty. An excellent Instrument for this Purpose is the Ant-hill Plow, figured in our succeeding Plate; its Structure will be understood by any tolerable Workman from the Figure, and we need only caution the Husbandman, that it be made strong in Proportion to the Service. The Timber Part must be Elm or Ash, and its two Sides about five Inches square; the Iron Part must be made thick enough, and be well steeled; and it is to be drawn by two or more Horses lengthwise.

This being properly guided, will cut through any Depth of Earth in these Hills, and taking them off entire, they may be easily removed, and the Surface will be left perfectly even.

When the Edge of the Iron wears, it must be carefully repaired, and the Implement always kept in good Order. The Advantage is very great above any other Method, for the few Ants that are left in the Ground, are exposed to all Kinds of Injuries, and are seldom known to be much troublesome again; and the smooth naked Surface being immediately sown with Hay Seed, presently becomes uniform with the rest of the Ground.

The Expence is little, for a tolerable one may be made for a Couple of Guineas, and a very good one, fit for any Service, for Half a Guinea more; and the Price will be soon saved by the Quantity of Business done: as many Hills may be cut down with this in a Day, as would take ten or a dozen Labourers a Week.

The Person who guides this Plow, will make it cut deeper or shallower as he pleases, by raising or lowering the Handles; and there is nothing it will not make its Way through, with a good Hand to guide, and a proper Force to draw it.

The Business of the Person who guides it is to cut all smooth and level with the rest of the Surface. The Hills being thus cut up, there remains the Care of disposing of them so, that they shall not afford a Return of the Mischief. Many Ways have been devised for this Purpose. It is evident the common Methods of spreading them on the Ground, or carrying them to the Dunghill, are extremely wrong: but we shall shew the Farmer how he may at the same Time be sure thoroughly to be rid of the Danger of their renewing the Mischief, and at the same Time make an Advantage of them.

In the Use of this Plow we have said the bare Space made by cutting up the Hill, is to

be sown immediately; for that Reason a Person is always to follow the Plow with a Parcel of good Hay Seed in his Pocket; and while he carefully sows this on the bare Spot, others are to follow and take Care of the Substance of the Hills.

These are to lay them in Heaps, which are to be made with Care, not very broad at the Bottom, but high and hollow; and when they have stood a little to dry, they must be set on Fire, and burnt to Ashes, in the Method we have shewn in the Article of burning the Baite.

Where there are but few of the Hills, they may be easily piled up in the several Corners, and waste Places, and burnt upon the Spot, (which is much the best Way) without damaging the Ground; but where there are a great many, as in Places where the Ground is over-run with them, they must be carted off the Spot, and burnt in some waste Place, the nearer the better, for the Convenience of carrying back the Ashes; for, in both Cases, the Ashes must be carried over the Ground, and spread carefully, and they will serve as an excellent Manure.

We have observed that up-land Pastures require now and then to be refreshed with some Dressing, there is none better than these Ashes; and 'tis in those Pastures, where they are most wanted, that the Hills are most frequent. In this Case the Grass will grow every where with an Aspect of Strength and Freshness; and that on the Places where the Hills stood, will soon equal the rest.

There are other Methods of using these Hills, when they are cut up to Advantage, as a Manure; and the Farmer, according to his Discretion, may use one or the other. He will find in our Chapters on Manures, which Kind of Dressing will be best for his Grass Ground, according to its Situation, and other Accidents; and let him prefer such of the several we here propose to be made from the Hills, as will best agree with its Nature.

We have mentioned the burning them to Ashes, which, on many Occasions, is the best and readiest Method. A second Way is to carry them all off the Ground, and lay them together to rot perfectly. The Ants will be thus better prevented from a Return, than by throwing in the Hills among a common Dunghill; for, in that Case, they ramble about the Heap, some Parts of which are dry enough for their Reception; and as it is soon carried on to the Ground again, many of them remain there till they go with it, and then increase, and make new Hills; but, on the contrary, when the Hills are thrown into a Heap to rot alone, they become very moist throughout, so that there is no Place for the Ants to live among them, they must either leave the Matter, or be smothered among it: one Way or other the Ground being cleared of them, and the Manure also: there will be no Danger from its going on again. This rotting of the Turf takes Time, and by that Time it is ready for spreading, the whole Race of these little Vermin will be utterly destroyed. It may then be spread over the Ground without Danger, and will prove an excellent Method of refreshing it for a new Crop.

A third Way is to use the Hills entire, and they



The Proprietors of this Work having been favoured by an unknown Correspondent, with this Proposal for the Improvement of Fences, give it to the Publick in the Author's own Words; with a Plate designed by Mr. WALE, from his Original Drawing, and engraved by Mr. BOYCE.

A Proposal for the Improvement of Hedge Fences.

INstead of cutting the full grown Hedge Wood to the Root, on new fencing an Inclosure, and defending the naked Bank with a dead Stake wreathed Hedge, according to the present Practice, this Proposal is made to introduce the Use of a Pollard Hedge.

To illustrate the Description of this Fence, Reference must be had to the Plate A.

The Structure of the Pollard Fence.

N^o 1. Are Stems of the full grown Hedge left standing four Foot high from the Bank, at proper Distances; and it would be still an Improvement to have these Stems left standing two, three, or more, deep laterally, as well as in the Line of the Hedge.

N^o 2. Are the same Stems or Pollards interwoven with some of the

the Lops of the old Hedge to thicken the Fence.

N^o 3 and 4. Are the same Stems or Pollards of some Years Growth after cutting Pollard wise.

The Use and Advantage of a Pollard Hedge Fence.

1st. The Pollard Hedge will yearly grow thicker and stronger. Cutting the Hedge to the Root renders the Shrub weak, and subject to decay: whereas leaving Pollard Stems with their lateral Branches (which must carefully be preserved) to the Root, gives Vigour and Spirit of Growth to the Plant; and a seeming Sollicitude to recover its late Mutilation, by multiplying at every Eye of the Stem, Branch, and Root: this it does so profusely, that in a very few Years the Fence will be as difficult of Access, as a Wall cover'd with Thorns; and at length the Pollard Stems, &c. will grow so obstinate, that the Strength of a Horse will be too weak to make a Breach in this stubborn Rampart.

Every Hedge, how weak or slender soever at present, may, with great

Ease, be nursed into the most stubborn Pollard Hedge: but the Farmer must avoid lopping it too often, lest thereby the Pollard Stems fail to increase in Bulk.

2^{dly}. The Pollard Hedge yields to the Tenant, more Fire Wood than any other Kind. It also yields a Fence that will require no Expence to maintain, and demands little or no Wood for Brush Stakes or Copping, as are expensively required in the Case of a dead Stake Hedge.

3^{dly}. The Pollard Hedge will prove profitable to the Owner, as well as the Occupier of the Land.

At the End of a Lease, Fences are generally down, and decayed; and the new Tenant will require them to be repaired at the Owner's Expence. Many Owners have felt the Deduction of a Year's Rent in this Article: let this Intimation therefore be remembered by Land Owners, that it will be profitable to themselves, and Tenants also, to fence their Lands, in their Leases, with Pollard Hedges.

they are cut up in Compost: The Reader will recollect, that we have recommended the Use of a covered Pit for Dung, and other Ingredients, to make Compost, and have given a Figure to explain its Structure.

Into such a Pit the whole Hills may be thrown among the Mud of Ditches, fresh Horse Dung, and the Drainings of the Cow House and Stables; here all is kept so moist, and in such a State of Fermentation, that it is impossible an Ant can live, or any Principle of Life can remain in what are called the Eggs, during the Time of the whole remaining there together: therefore the Addition in Point of Quantity, will be very great, and the whole may be used equally for the plowed Land and Grass Ground, without the least Danger from the Ants in either.

What are called Ants Eggs are the Cases in which those Creatures remain a Time in Quiet, before their Perfection in the winged State. Reason shews they cannot be Eggs, because they are bigger than the Bodies which are supposed to have laid them; and we see Bees, Flies, Butterflies, and all other Creatures that have Wings, go through a State of Rest in this Manner, before they attain their perfect Form.

A fourth Way of using these Ant-hills with Safety, and to the Advantage of the Ground, is to make them into a Kind of dry Compost with Lime, and other Things: this is a very safe Method, and is more expeditious than the other: but the Farmer by this Time well knows that different Grounds require various Manures; and he will therefore take whichever of these Methods best suits the Nature of his particular Pasture.

The Method of using it in Form of the dry Compost is this. When the Hills are cut up by the Plow, and carried out of the Field, they are to be thrown on a Heap in some waste Place; and a Quantity of fresh and sharp Lime being in Readiness, it is to be strewed pretty thick among them; and so managed, as to reach every Part of them.

To this Purpose the best Method is to spread a Parcel of the Ant-hills on the Ground as thick as they can lie, without covering one another; and on these to strew a good Quantity of Lime: then to lay over this another Coat of the Ant-hills, and then another scattering of Lime, and so on, till all the Hills are piled up.

In this Manner let the whole remain ten Days or a Fortnight, and in that Time the Lime will have taken so good Effect, that there will not be an Ant found in the Place. Then let a Quantity of good fresh Dung be laid on the Heap, and from time to time let it be well worked and turned as other Dung is. This Compost may be laid upon the Ground from which the Hills were taken, and there will not be the least Danger of their propagating again; and the Benefit, in a tolerable good up-land Pasture, will last six Years. This I have found by Experience; nor do I know any Manure so good, on a proper Soil, as this Mixture of Dung, Lime, and Earth, for Grass Grounds. The Bodies of the Ants, which are very numerous

in the Hills, will also, in this Case, add a great deal to the Efficacy; for we have shewn before, that all Animal Substances are full of rich Matter for the Service of Vegetation. This Mixture of Dung and Lime with Pond Mud, is excellent by way of Manure for Grass Ground; but when the Earth that is used for this Purpose is thus impregnated with Animal Matter, by being the Residence of Millions of these Insects, and full of their Excrements, the Benefit is vastly greater.

When the Farmer sees the Practice of cutting up Ant-hills thus in its full Light, he will be able to count up the Gains rising from a proper Use of the Instrument by which it is to be performed, and he will find that in a Course of six Years Growth of Grass, the Expence of the Instrument, the Labour, and every Thing that can be brought into the Account, will be above forty Times returned to him; and all the while he will have his Pasture lie in a Manner agreeable to his Eye, in a proper Condition for the Mowers, and for the Cattle.

Among the Accidents to which Grass Grounds are liable, the lodging of Water upon them might be enumerated; and, indeed, as the principal; but that we have treated of already, under the Article of Draining; therefore having gone through the Account of Things which may hurt the Farmer in this Respect, we shall now proceed to the Improvement of this Part of his Farm, by removing the greater Annoyances, and enriching the Soil.

CHAP. VI.

Of clearing a Pasture Ground from Stumps and Bushes.

THE Way of drawing Thistles, Docks, and the like large Weeds by their Roots, has been laid down among the other Methods of improving a Grass Ground, by removing the Accidents that hurt it; but we are here to consider a much greater Annoyance, which is, the frequent Growth of bushy Stumps, and unprofitable Shrubs. These are not uncommon in many up-land Pastures, and they are suffered in the same Manner as Ant-hills, to remain upon the Ground by the Idleness or Carelessness of the Farmer, till they reduce the Pasture to the half or third Part of its Value.

I shall here speak of what I have very lately seen practised, partly by many of my own Advice, and partly by the Spirit and Resolution of the Owner; by which about eighteen Acres of up-land Pasture, have in five Years been rendered of four Times their former Value.

This Pasture was one of those up-land Pieces, of which there are many in BUCKINGHAMSHIRE, and most other Counties where the Grass is but little in Quantity, but very sweet; and the Ground is over-run in Patches with Broom, Furzes, and Butchers Broom.

Walking with the Owner of this Piece of Ground, who kept it in his own Hands because no-body would give him any Price for it worth naming, I proposed to him to undertake its Improve-

Improvement. This I told him must be set about by two Methods at once; the one was, the getting up all these Shrubs, and the other, laying on a good deal of rich Manure. Few would have had the Spirit to venture so much as he did on this Advice, upon so barren a Piece of Ground; but three Years Profit amply returned it to him, and now every Farmer in the Neighbourhood is desirous of rearing the Field. The Method he took for clearing it was this. He had, according to my Directions, an Instrument made for tearing all the Shrubs up by their Roots; which, from its Use, I shall take the Liberty to call an Eradicator. The Invention is not mine, but as old as the Time of GABRIEL PLAT, who has mentioned it in his Discovery of hidden Treasures.

It is a very large and strong three-pronged Fork, which, by the Assistance of a Block, as a Leaver, is of sufficient Force to tear up any Thing. The Bigness of it is so much more than a Dung Fork, which it most resembles, that it seems improper to call it by such a Name, wherefore I have given it another. It is to be thus constructed. The Handle must be a long and thick Beam of Ash, its Length fifteen or sixteen Foot, and its Thickness such as will keep it firm against a great deal of Force. The Tines should be twenty Inches long, notched at the Sides, and a little leaning upwards; and they must be joined to a strong Shoulder of Iron, with proper Fastenings, for the End of the Pole. This being carefully fixed on, the Person that works it must fasten a Rope of six or eight Foot long to the other End, and take with him a thick Block of Wood, and a heavy wooden Beetle.

When he comes to the first Shrub of Broom, Furze, or whatsoever; he must force in the three Points flanting into the Ground, so that they go under the Root; and the Top of the Pole be somewhat higher than his Head: then with good Strokes of the Beetle, he must drive it well in, till the Tines are quite in the Ground: he is then to lay the Block under the Pole, near where the Tines are, this will raise its Top ten or twelve Foot high; and he is then to lay hold of the Rope, and pull with all his Force.

Those who know what the Effect of the Lever is, will be sensible no Root can keep its Place against this: it will tear up the most firm; and, in some Kinds, will draw out Fibres of seven Foot in Length.

When one is up, he is to proceed to the next, and so through the Field; throwing them on Heaps as they come up, that they may be ready for carrying off the Ground.

The Field I have been speaking of when we begun this Work, was so full of Tufts of Shrubs, that there was not ten Yards of it that could have been mowed, if the Produce had been worth it; and it was very inconvenient even to feeding.

If we had employed Men to grub them up with Pick-axes, as is the common Way, it would have cost at least twenty Times the Price; and the Ground would have been tore up in a sad Manner; and when we had done,

so many of the broken Roots would have remained, that there would have been presently a new Parcel of Shrubs upon the Ground; whereas in this Way, the Expence was little or nothing: the Price of the Instrument no great Matter, and it will last for ever; and the whole Charge of working it, a Couple of Labourers Wages for the few Days that was necessary. The Ground was no where broken to signify; the Roots, in this Manner of drawing, only cracking the Turf, which fell together as soon as they were out; and the biggest not so much as distinguishing the Ground for a Foot space, and that mostly made up again by the falling of the Surface together.

When the Ground was thus cleared, we got together a large Quantity of Manure made of old well rotted Dung, and the Mud of the River; among this we mixed the Bottoms of a Couple of old Hay-stacks, which was a rich rotten Earth, full of Grass Seeds. This being spread thick upon the Ground, and washed in with the next Rains, the Effect was in a Manner miraculous; from a miserable barren Place, it became the next Spring very fine Pasture, and is now a prime Piece. The Roots of the old Grass shot freely, having no longer the woody Fibres of the Stumps to intangle with them, and hinder their Progress; and the Seed, most of it grew so, that here was Abundance of Nourishment, and a great Number of Plants to draw it.

This is to be done in any Place in the same Manner, and the Advantage will be the same. Plor might very well call the Secrets of Husbandry a hidden Treasure, for we see such of them as he discovered exposed to view; nay, such as the most common and popular Writers copied from him, and inserted in their Books one after another, yet remain unknown or unheeded by the Farmer, who might so greatly add to his Profits by their Use. This is an Instrument no Farmer ought to be without, who has any of this poor, and over-run Pasture Ground upon his Hands; and, by a proper Use of it, I am convinced by what I saw on this Occasion, that a great deal of what lies nearly as waste Ground in this Kingdom, might be made to bear a Price. The best Time for doing this is after Harvest. The Ground will then have Winter to be quiet; and, in Spring, the Shoot will be seen strong and fine.



CHAP. VII.

Of improving mossy Pasture Ground by burning.

IN the last Chapter we treated of the Methods of improving Pasture or Grass Grounds, when over-run with useless Shrubs: we are here to consider another Annoyance; which, though less conspicuous, is as pernicious in the Effect; this is, the spreading of Moss, or other low and worthless Matter among the proper Growth.

Moss is a sculking Enemy to the Farmer in his

his Pasture Grounds, but a very fatal one; the Grass where this is predominant will appear low and thin, and the Cause at first perhaps will scarce be seen, but on examining there will be found, as it were, a Carpet of yellowish Moss spread over the Surface of the Ground, through which the few Blades of Grass have Difficulty to make their Way: as this continues the Mischief encreases, for the Moss sending out its Side Branches and young Shoots, thickens more and more, covers the Earth with a deeper and more compact Coat, and makes the Growth of any thing else more and more difficult among it.

This is commonly the Fault of Ground that is too damp.

In the same Kind of Land, when a little wetter than this, we see Tufts of Rushes, or of what though less conspicuous, is as mischievous; a low Kind of Rush Grass, this grows in thick Sods and covers a great Part of the Ground, nothing grows among it, and not much between it. The Sods spread and encrease from time to time, till at length they will overspread the whole Piece.

These, as they are the Faults of the same Kind of Ground, require the same Kind of Remedy; and what we shall advise in this Case, though a very expensive one, yet is so certain of Success, and the Misfortune so incapable of being remedied any Way else, when grown to an Height, that it will always answer, and always be found more advantageous than the cheaper and more imperfect Methods. What Grass there does grow on these Grounds is small in Quantity, short, and poor. In dry Pastures the Grass is frequently short, but it is sweet; and where there is little of it, that little is good; but here it is quite otherwise, what poor Growth there is, is sour, and Cattle neither like it nor thrive upon it.

The Way to remedy the Evil is by burning the Rubbish with some small Parings of the Surface, and sowing a better Crop.

To this Purpose the Turf is to be pared up in the same Manner as we have described for Burn-baiting, and to be set up on Heaps, and when dry to be fired.

It is a Sort of Stuff that will take Fire readily, and will presently burn out. The Ashes will be a very rich Manure, and the Roots of the Moss, and other mischievous Matter will be perfectly destroyed.

The best Time for doing this is in the Beginning of October. When the Heaps are reduced to Ashes, these are to be spread upon the bare Surface and plowed in. The whole must be then sowed thick with Hay Seed, and the Event left to Nature. There will soon be a short Green Covering upon the Surface; and this, as it makes no great Shoot upwards during the Winter, will be all that Time strengthening itself about the Root. It will thus get into Tatts, and entangle and mat the Fibres together during the Winter, and in Spring it will shoot up, and be a very pretty Pasture.

At the same Time that this is done there should be Drains cut through it in two or three Places, to carry off the Water that occasioned the Dampness, and thus the Owner will indeed have a

Right to expect a new Kind of Produce, for he will have a Sort of new Land.

In the Choice of the Seed for this Service, there is to be great Care taken it come from Hay that had grown on Land not altogether unlike this, in Respect of Moisture.

We have observed before, that the Botanists reckon up a great Number of Kinds of Grass; and have told the Farmer he needs not concern himself about their Distinctions: this is all he need regard, that as some Grass Grounds are moist, and some dry, there are certain Kinds of Grass that grow on the one, and certain other Kinds on the other; and that he is to suit his Seed so far to his Ground, for that the Seed of the Grasses that delight most in wet Grounds will not succeed on such as is dry; and in the same Manner the Seeds of Grass from upland Pastures will, in a great Measure, miscarry in Meadows. Therefore when Hay Seed is taken for the Purpose of sowing this new recovered Land, it must be got from such Hay as has grown on Meadows in low Places, not that of upland Pastures. This will strike freely and spread properly, so that there will be no Danger of a good Harvest of Hay the very first Year; and from that Time the Ground will continue encreasing till the third; after which, if no farther Care were taken, it would decline; but when the Husbandman is informed of this, he must take Precautions accordingly.

We have had Occasion, in a former Part of this Work, to observe, that the Effect of burning the Surface is very great for the Time, and lasts some few Years, but afterwards leaves it worse than it was: this which we there shewed to be the Case, with Respect to Corn on burnt Land, is much the same with Grass, only less in the Extream both Ways. The Fertility is not so surprizingly great; neither is the Effect so bad afterwards.

However, as in this Case the Ground will grow weak after three Years, Care must be taken to renew it by proper Manures before that Time; and the best for this Purpose are those which are most lasting in their Effects.

If there be a proper Kind of Marle in the Neighbourhood, a good Quantity of that should be laid on at the End of two Years, taking Advantage of a dripping Time in October. The finest Part of the Marle will so be washed into the Ground at once; and the harder Lumps will break with the Frost, and then their Substance will wash in after the same Manner.

When there is no Marle, Pond Mud is the best Manure; but this never succeeds so well on those Occasions, as when it is mix'd with rotten Dung, and the Bottoms of old Hay Stacks.

These Methods will keep the Ground in Heart. And the Person who has recovered it for himself, will leave it in the same Condition to his Descendants.

C H A P. VIII.

Of improving common Grass Ground by Manures.

DUNG is an universal Manure for Grass Ground, and the more mellow and rotten it is, the better: most People content themselves with it, and seek no farther, but we have said before, that Grass Ground being of different Soils as well as Corn Land, admits with Advantage the same Diversity of Manures. We shall here consider them in a short Compass, having entered at large upon their several Natures before.

For Grass Ground of the common Kind, where the Soil is a fat Loam, or a Loam with a very large Quantity of mellow Earth among it, the best of all Manure is what we have already named, old Dung and Pond Mud mixed together. This may be considered as the general Manure for these Grounds; and the Time of laying it on is according to the particular Circumstances or Use the Farmer makes of his Land, from SEPTEMBER to FEBRUARY.

The most favourable Time of all is in the Middle of Winter, that there may be Frost to dissolve and break to Pieces the harder Parts of the Manure, and the Rains may wash the whole into the Ground at their Leisure, while there is no great Power of Sun to evaporate the Virtue of it as it lies spread on the Ground.

The Way of laying on Manure upon Grass Ground, is to drop it in small Heaps at due Distance; and first employing Labourers to break and spread it well by Hand, the Owner is afterwards to have it worked over with a Bush Harrow, which we have described in a former Part of this Work, but have figured in the succeeding Plate, among the other Implements used in the Grass Field.

This Harrow is to be lightly drawn to and fro over the Ground, till the whole Quantity of the Manure be thus torn to Pieces, and spread over the Place; it will then be soon buried among the rising Shoots of the Grass, which will grow up apace from the Effect of its enriching Quality, and what remains will have Time to get thoroughly well into the Ground.

This we have laid down once in the Use of the common Manure for a moderate Soil, and shall not repeat it as to the others: whatever Dressing we order to be laid on Grass Grounds, this, so far as its Nature allows, is the Manner of spreading it.

When a Piece of Grass Ground produces Moss, and other bad Things, but not in such a Degree as to require the Method of cutting up and burning, the best Method is to strew over it twice a Year, namely, in OCTOBER and in the Beginning of FEBRUARY, a Mixture of two Parts Coal Ashes and one Part Wood Ashes, wetted with the emptying the Pots of the Family.

On a Piece of Grass Ground that is cold, but not very wet, let the Husbandman spread a good Dressing of Pigeon's Dung; or of the Dung of Fowls mixed with Earth and Coal Ashes. This

is to be done at the latter End of FEBRUARY, and being the richest of all Manures it must be spread with the greatest Care and Attention; it will thus come to the Roots of the Grass, just as they are about to make their Shoot, and will cause twenty Blades in many Places to grow for one.

There are good Grass Grounds on the Sort of Soil quite opposite to what we have been naming, that is, on such a Loam as having a great Proportion of Sand, and little of the binding Ingredients in it, is hot, loose, and crumbly. In this Case the Manure must be varied as the Soil varies; and of all that can be recommended, nothing comes near the Virtue of any one of those clayey Marles we have described under the Head of Manures; a Dressing like this laid on early in Winter, becomes quite broken and mouldered by the Spring, and will all wash into the Earth, the Consequence is that it gives the two Qualities wanting Firmness and Fatness. The Quantity of Hay may very well be doubled by such a Dressing, and the Feeding in Proportion; and although this be an expensive Manure for Grass Lands in the first laying on, yet it very well answers in the End; for the Effect, instead of three or four, which is the common Duration of Manures, will last ten or twelve Years.

There is a hungry, cold, brown Soil, not uncommon in Pastures, consisting of some poor loamy Earth, and a little Gravel. On this no Manure answers like Chalk: but then it must be a proper Kind, otherwise there will be Damage instead of an Advantage.

There is Chalk as hard as a Stone, and there are other Kinds as soft as Butter. If the first should be used it would lie like so much Rubbish on the Surface, and cover one half of the Ground without doing any Good to the other: but if the latter or soft Kind of Chalk be chosen, it breaks and dissolves with the Weather, and washes in entirely. NOVEMBER is the proper Season for laying on such a Manure, and the Frosts acting on it first, and afterwards the Rains, it will all work in so perfectly, that by LADY DAY there shall not be a Lump as big as a Nut any where seen upon the Ground.

In some of the up-land Pastures in DERBYSHIRE and STAFFORDSHIRE, there is a Kind of brown Earth full of Fragments of Stone. The proper Manure for this is Lime: we have shewn in the treating of Corn Land, what a vast Effect this Substance takes in sweetening and fertilising Land; and it has altogether the same in Pasture as in plowed Grounds.

When a Grass Ground is very sandy, the Crop must of Necessity be very thin, but the Grass will be sweet: in this Case, if there be in the Neighbourhood a soft Clay, with a small Mixture of Sand among it, this serves as an excellent Manure; for the Sand in the Composition will make it break and moulder, which Clay alone would not, and thus it will wash into the Ground. Thus it will give Firmness and a Body to the Soil, which is all this Kind wants, and as to the small Quantity of Sand that gets in along with it, that is only added to the general Mass, and can do no Harm.

These

These are the several Manures that succeed best on the various Kinds of Grass Grounds; and the Farmer sees the Soil to which they are suited, and what are the best Times of laying them on. We need only give him this Caution with Respect to them all, that the Expence of them should never deter him from their Use, for that the very dearest always bring a manifold Return.



CHAP. IX.

Of the general Management of Grass Ground.

THE two Purposes to be answered by Grass Ground, whether Meadow or Pasture, are the feeding Cattle at certain Seasons of the Year, and the affording Hay at others: the Farmer is to have both in his Eye, and to consider their several Benefits, that he may know where to borrow from one, for the Advantage of the other, when he knows the Profit will be answerable.

The first Consideration is of the Time for feeding, and the Time for laying up for Hay. This varies greatly in different Parts of the Kingdom. The different Situation and Condition of the Ground makes some Variation on this Head very natural and very necessary; and the Circumstances of the Farmer, with Respect to the Necessity of feeding, must in some Instances be allowed to break in upon what is known to be more right.

In Places where they have Plenty of Manure, and make two Crops of Hay, the Custom generally is to lay the Ground for it about the Middle of FEBRUARY. And in this Case a little more than three Months gives it a Growth for cutting; so that there is Hay by the Middle of MAY: in other Places they are five Weeks later in laying them for Hay, and the latter End of MARCH is a common Time.

In the Northern Parts of ENGLAND I have observed they are as backward in their Hay-making, as their Corn Harvest, and they lay their Grass Lands for Hay accordingly. MAY DAY is, in these Places not an uncommon Time.

There is nothing so wrong in the Husbandman's whole Practice, as the deferring the laying his Ground for Hay so long: it may be convenient to him to feed upon it; but let him consider what will be the Effect of a hot dry Summer, and what will be the Loss if he be disappointed of his Crop. Spring is the Season for the Grass to make its Shoot; and if it be eaten over and over again at that Time, and hot dry Weather follow, it is deprived of the Benefit of Rains, and never makes that first Shoot tolerably, nor comes to any reasonable Growth afterwards. For these Reasons let the Farmer suit his several Occasions so, as to be sure of laying down his Ground for the Hay in Time; and if he lose something in the Advantage of feeding, he may be perfectly assured of making himself ten-fold Returns for it, in this more profitable Article. We shall begin the Management of Grass Grounds with the Preparation for laying them down,

and from thence date the Beginning of the Farmer's Care.

We will suppose him in the Middle of MARCH, to take off his Cattle from the Grounds where he has good Expectation of Hay, and to prepare for it by making all clean and even.

As soon as the Cattle are off let him send in Women or Children to finish the clearing of the Ground, by picking up the broken Boughs of Trees that the Winter Winds may have thrown in upon the Grass, and every other Kind of Annoyance: this done let him send in a Labourer or more, according to the Compass of Ground, and let these have Orders to break and spread all about, the Dung that may have fallen from the Cattle upon it; and also to break and scatter any fresh Mole-hills.

This being done, the Expence of which is very little, and the Convenience and Benefit very great, let him order the Ground to be rolled carefully and thoroughly.

The rolling Grass Grounds intended for mowing is of great Consequence, as it prepares the Surface for the Scythe, and destroys the last Accidents that can happen to it during the Preparation for Hay.

In the Winter Months the Surface of the Ground will be rendered here and there unequal, by the treading of Cattle, in such Places as the wet has most affected, and where it has lodged most: these make the Growth of the Grass so far irregular, and therefore are an Injury.

During the first Approach of Spring the Worms will be at Work, and will every damp and mild Night throw up Abundance of their Casts; these also are like the other, Nuisances, though not great ones, and they hinder the right and regular Growth of the Grass: if there be Moles, or if there be any Ants left, they will also be at Work at the same Time; and this is a Season at which all should be set right; and the Condition of the Ground is such that it will easily be so. The Roller will answer the Purpose, for it will take more Effect at this Time than at any other.

The Winter's Frosts will have mellowed all these broken Parts of the Ground, and the Spring Rains will have softened them, so that the Roller will take full Effect upon them. The Rubbish of all Kinds has been taken off, and all the old Unevennesses taken down, so that there can be nothing in the Way hard or different from the general Surface; therefore the Roller will break and crush all the little Irregularities there are, and laying the Surface perfectly even, will make Way first for a regular Growth of the Grass, and next for the easy cutting of it.

The Roller is to be of Wood, but it must be made as true and even in all its Surface, as if cut out of Stone, or cast in Iron. In general, the heavier it is the better; therefore it should be large. The Trunk of a good sound thick Elm makes the best Roller; but the lower Part must be cut away to a Truth, and none of the Bark should be left on the other.

We have shewn the Farmer how he is to cut up his Ant-hills. But this is a Practice that will, in a great Measure, prevent the Expence and Trouble of that Article. The Spring is the principal Time when these little Vermin are at work;

work, and if they be prevented then, they will, in a great Measure, lie still till that Time twelve Month. The rolling with a Roller of proper Weight, crushes down and destroys their new Work, and kills a great many of them; after which the rest scatter so, that there seldom is any Mischief.

There is a farther Use in the Rolling of Grass Ground, of which few are sensible; and this is, the pressing down the Earth about the Roots of the Grass, and by that Means securing the young Shoots, on which a great Part of the Hay depends, from Accidents by the Variety of the Weather.

We see in Gardening that Frosts are most fatal to Plants, when the Spring has been some Time advanced: the Heat of the Weather making the succeeding Cold of the Nights more hurtful. It is the same in Respect of this young Grass, and this pressing down of the Earth prevents it.

In the succeeding Months also, if there do not fall Rain, the Sun parches up the Roots if the Earth be left loose about them; but when it is thus pressed down, they are defended.

This pressing together of the Earth about the Roots, has also another Effect of great Consequence, in preventing the Lodging of the Grass: this Accident, which is as mischievous in a Manner to Grass as to Corn, happens principally from the Looseness of the Earth about their Roots. When the Grass or the Corn has some Height, the Wind will take Effect upon it, and bear it down; but then if it be well supported at the Bottom, it rises again as soon as the Blast is over, and there is no Harm done: the Wind rarely breaks the Stalk of Corn, and more seldom that of Grass; so that unless their Support fails them at the Root, they rise again. When the Earth is loose it gives Way, and being pressed down, they remain down; but when it is firm about their Bottom, no Harm happens: Rolling always gives it this Firmness, and therefore prevents that Accident.

When the Roller is brought on the Ground, a careful Person is to be employed in managing of it; and it must be drawn equally, and slowly along. The first Care is, that it go over every Part of the Ground; and the next is, that it be drawn leisurely, for otherwise it will not do half its Business. Whoever will watch the Passage of a Garden Roller, over a Gravel Walk when it is a little wet and rough, will see plainly this Difference: the same Roller, when drawn hastily over the Walk, shall take very little Effect; which, being drawn over it carefully, and slowly, will make all level.

In this Manner the Roller is to be drawn over the Pasture or Grass Ground intended for Hay; and when this has been done, the Farmer has nothing more to do, but to see his Fences are secure, and leave the Growth to Nature; the Shoots will be numerous and firm, and there will grow a large, and every Way excellent Crop. In low Grounds the Cattle may be suffered to feed somewhat longer than in the up-lands, unless the Season be very wet; so that it is some Relief to the Farmer. Though he should lay his higher

Grounds at the Time we have directed, he will have, in a tolerable Spring, a Fortnight or three Weeks; and, in a very dry one, a Month more for his low Grounds.

In these, as well as the others, when they are laid for Hay, let him take Care to have the Ground levelled, and all Rubbish picked off; for, when the Mowers come to work, all that Charge will be very well returned. There will be none of those Stops and Stayings that there are; and always must be when there are Hills, locks, and other Impediments in the Way; and the Mowers will be able not only to go on with their Work regularly, but to come an Inch or two closer to the Ground; and this is a very great Concern. The Farmers have a very just Observation, that one Inch of Hay at the Bottom is worth three at the Top, and they have Reason: nor is the Aftermath at all the worse for this close Cutting. That does not depend upon the Stumps of the old Grass that are left, but upon the new Shoots made from the Root; and the closer those are cut, the more free that Shoot comes, so that the close Mowing is every Way an Advantage.



CHAP. X.

Of Mowing.

THE Ground being thus carefully laid for Hay, the Farmer has no farther Care but the knowing when to cut it. This he must carefully observe, for there is a proper Time of Ripeness; and all after, as well as all before that, is so much Loss.

When a Piece of Ground is laid early, and has been properly assisted by Manures, it will often be ready to cut in the End of MAY.

There are those, who, in a forward Season, cut it earlier, taking the first Appearance of Ripeness, imagining they are securing their Interest, by preparing early for a second Crop; but they often lose more in the first, than it is possible they should get in the latter. The first Crop of Hay is the great Article, and should be regarded accordingly: the other is always trifling in Comparison.

There is a Time of the Year when every Plant flowers; and Grass, like others, has its Season. If we examine in other Plants the Course of Nature, we shall see that though their Leaves stand pretty well during the flowering, they wither when they come to ripen the Seed. The Leaves of Grass go to the Quantity of Hay as well as the Stalks; and are indeed the best Part; they are not therefore to be neglected for the Sake of the other. The several common Kinds of Grass, in well managed Pastures, get into Flower in the End of MAY, or Beginning of JUNE, this therefore is the natural and proper Season for cutting of them. The Hay will not have its due Quantity till the Stalks are full grown; but after that Time, the Leaves will fall so fast into a State of Decay, that there will be more lost by twenty Times at the Bottom, than there is gained at the Top. The Price of Hay is very

very considerable, but that depends upon its Goodness; and this upon two Articles, the Time of cutting, and the Manner of making; and upon the former little less than on the latter.

The Faults in making are most obvious, but there may be poor Hay got from a very good Piece of Ground, either before, or after the right Season of Mowing; while that which is truly excellent can be had only by seizing the right Time.

The fine green Colour of Hay is very much valued. This is owing, in a great Measure, to the making; but then it must be in the Grass itself, otherwise all the Care that can be taken in drying it, is all in vain: a proper Method of Turning will preserve a Colour, but it cannot give it: that must be from Nature.

This fine Colour depends, like the rest of the good Qualities, on the Time of Mowing, or the Degree of Ripeness of the Grass. When it is just in Flower, the Leaves are fresh and green; but when it is got to Seed, they grow brown: this is the first Step toward their Decay, and this is the Change of Colour which no Art can recover.

While the Grass is but coming to Perfection, it is too green; when it has stood too long, it becomes brown; and that fine pale green Colour so esteemed in Hay, can never be obtained by any Art afterwards.

The Smell of Hay is another Article of its Value, and this, like the rest, must be preserved by Care in the making, but it must be entirely owing to the Time of cutting.

Hay that has stood too long, has the Appearance of so much Stubble, and has no more Smell; whereas at the Time of the Grass flowering, which is its just State of Perfection, there is one of the pleasantest Flavours we know, from the cutting through of the Stalk, and the evaporating of its Juice in drying. The Colour of the Stalk fades as well as that of the Leaves, after the due Season is over; and we shall see this plain enough, if toward Autumn we look upon such Grass as has run up among Bushes, out of the Reach of the Scythe and Cattle. The Stalks of this were at one Time in a Condition to make the finest Hay, but after that we see them dry, brown sticks, and without Taste, Smell, or any other Quality.

The whole depends upon this Principle before established, there is a State of Perfection in all Vegetables, and the Art of the Husbandman must be employed to observe, and his Prudence to seize it. This State of Perfection with respect to an entire Plant, is just the Time of its flowering. When we mean to save the Seeds of any Thing, we must stay longer; and, in that Case, we see the Plant wither; but the Time of its Perfection is just the coming into Flower. The Apothecary buys his Herbs for Distilling at that Period, knowing that just when the Flowers are opening, the Stalks, Leaves, and every Part are the fullest of Virtue: and it is so in Grass. The Farmer must make the same careful Observation, and the same Choice.

Now that we have given the Reasons for
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choosing Grass at such a Period for Mowing, it is proper to deliver the Marks by which it is known to be so. Let the Farmer to this End take in the Examination of the whole Plant. It may be seen by the Heads alone, but as the Effect of their ripening shews itself at the Bottom also, let him take in both.

Thus let him go into his Grass Fields from time to time toward the End of MAY, and during the Beginning of JUNE, if not prevented sooner by the full Ripeness. Let him examine the Stalks which will be now grown up in Height, and see how their Tops approach toward Ripeness; he will perceive from time to time the little Heads swell, and at length there will appear a few white Threads. These, in some Kinds of Grass, only shew themselves on the Surface of the Buttons; and, in others, hang from them a fifth Part of an Inch. This is the Flower of the Grass, and when it appears, the Hay Time is near.

He must not judge from one or two Plants in a Hundred, but see when the whole Field thus gets into Bloom; and then he must be critical in his Examination. The fuller and fresher it is at the Top, while the Bottom remains perfectly sound and good, the better; therefore that is to be examined for the final marking of the Time. Let the Farmer open the Grass with his Hands in several Places, down to the Ground, and observe carefully how the lower Part looks: as these flowery Parts, or the Top ripen, the Bottom will grow brown. This is the first Mark of its Decay. After this the Top will get nothing; and the Bottom will lose a great deal, so this is the Time for the Mowing.

The Mowers are to be sent in, and the Ground having been thus prepared and levelled for them, they have no Excuse if they do not cut it close. These are a Sort of People, as every one knows who has had any Concerns with them, who are very apt to slight over their Work, and ready to seize upon any Pretence for doing so: they have no Consideration that their Carelessness is the Loss to the Farmer, perhaps of a tenth Part of his Crop: but let him take Care of it himself: as he has according to these Directions prepared the Ground for them, let him follow them, and frequently put them in mind of it: they will thus be brought to do much better than they ever will when left to themselves; and the Addition to the Quantity of the Hay will very well pay the Farmer for his Care and Attendance.

We commonly see the Farmers about London, riding in their Grounds among their Hay-makers, but this is an idle Custom: let them walk after their Mowers, and they will do themselves twenty Times the Service.

The Business of Hay-making is generally done much better than that of Mowing; and if any Omission be made in it, 'tis easily seen, and there is Time to rectify it; but in the Mowing, the Mischief is scarce to be seen, unless the Scythe be followed; and when it is once done, there is no mending it. The Grass being down, is to be carefully dried; and in this there is so much Difference between the Practice of the Farmers in the Parts of the Kingdom where

Husbandry is most improved, and the others, that it should be set in the strongest Light, to render those Improvements universal.

CHAP. XI.

Of Hay-making.

THE Grass being down, is to be turned and dried, and then it is Hay. This is the whole Process in a few Words, but there must go more to the well understanding of it.

We have directed the Farmer to cut down his Grass at a Time when it has a full Body, and a fine Colour; and we shall now shew the Methods by which it may be preserved, and the Neglects by which in many Places it is lost.

In the less improved Parts of the Kingdom, the Hay-making Season comes very late. They allow little Manure to the Grounds, they lay them up late; and, consequently, in the most favourable Summers they have but a poor Crop of Hay, compared with those who take better Measures; and in hot and dry Seasons, they have scarce any.

In these Places the Farmer never thinks of cutting his Grass till it begins to look brown at the Top, which indeed it does sooner than it would if better supplied with Nourishment; and then it is failing at the Bottom.

At this Time he sends in the Mowers, who cannot cut close because of the Unevenness of the Ground; nor does he insist upon it, for he imagines that the more they leave, the better will be his Aftermath. The Error of all this we have shewn, that it may be practised no longer; but we are very sensible that it is too common in a great Part of the Kingdom at present. When the Grass is thus cut, it has neither a good Colour, nor good Smell; so that no Art or Management could make fine Hay out of it; but if that could, it has not the Chance, for the Hay-making is as little understood as the Mowing.

They let it lie in the Swarth, and think they do enough if they turn it two or three Times in the Sun, never putting it into Cocks, till they suppose it nearly made; they then put it up in large Cocks, and let it stand a Week or ten Days to sweat, and then take it home, and put it up in a great Rick, the Labourers riding in Triumph in the Cart, as if they had done their Business notably.

Many have wondered at the Difference between the Hay about LONDON, and that in remote Parts of the Kingdom: it is indeed extremely great; but none will be surprized at it who see this Reason. The whole Management is bad there; and, in general, good in every Part here. We shall lay down the best Method in a few Words, and hope the improved Farmer will find his own Practice agree with it, and that others will mend by following of it.

The great Care in this Point, is to preserve the Colour. The Grass being cut in the Condition we have named, will be of a fine green, and this is to be preserved; for the Farmer may be assured, that a Loss of Colour is always at-

tended with a Loss of Taste, and Loss of Smell; and with a certain Loss in the Article of Price.

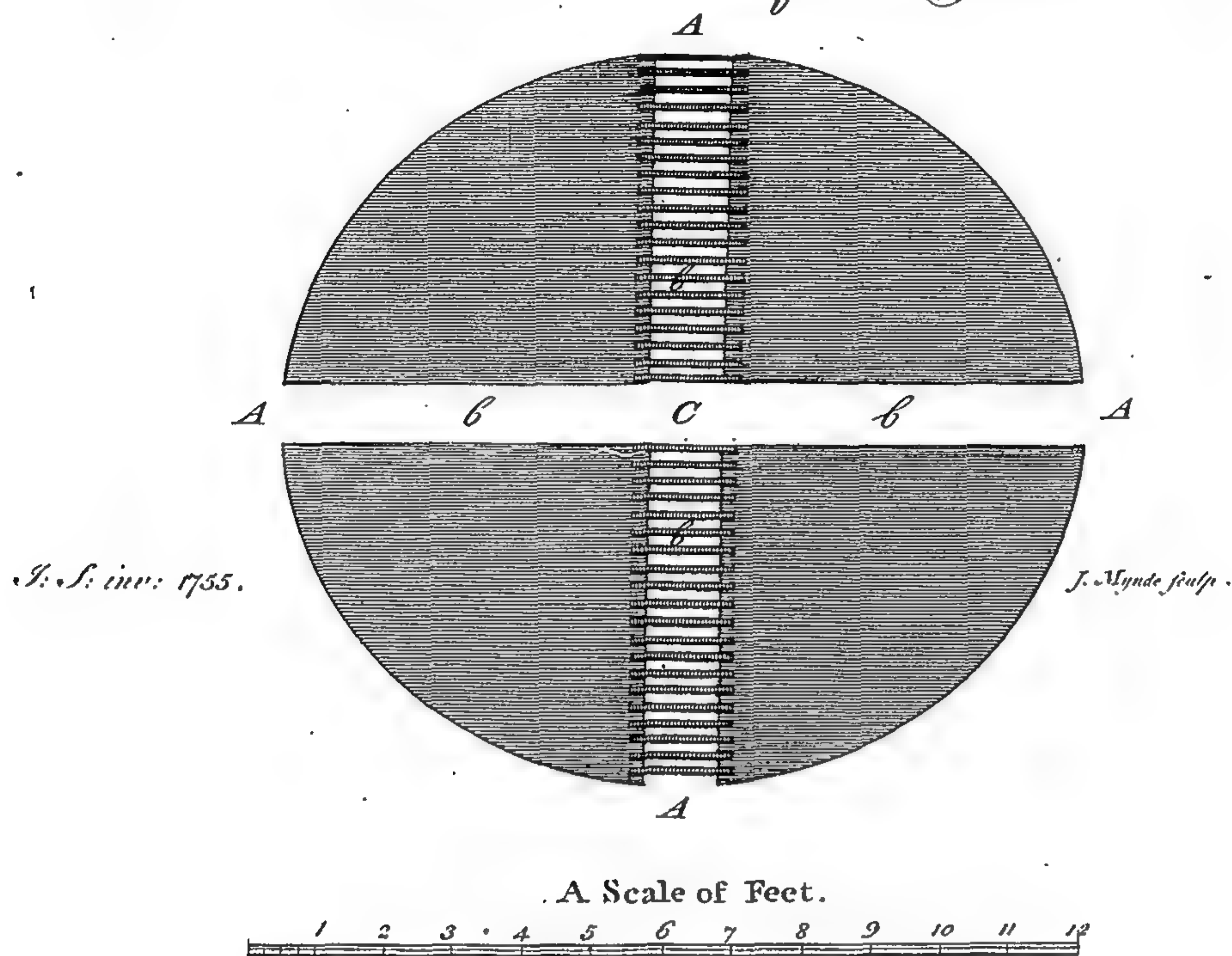
To preserve the Colour of the Grass, and give it the full Sweetness when it is mowed, it should be let to lie in the Swarth two Days and a half. At the End of this Time it is to be spread out, this is properly what is called tedding of the Hay; and thus it is to lie exposed to the Sun during the Remainder of the Day. Then it is to be made up into little Cocks, which are called Grass Cocks, at Evening, and so left for the Night. The next Morning, as soon as the Dew is off the Ground, these Grass Cocks are to be spread, and thus the Side of the Grass that had lain undermost, will get dried. In this Condition it lies all that Day. Toward Evening, it is to be cocked up again into the same Sort of little Grass Cocks as before.

This is a reasonable, and excellent Practice, for it at the same Time gives the Hay all the Advantage of the Air and Sun during the Day, and defends it from the Dews of the Night, which can do little Harm when it is gathered up in these Heaps; though while it lay spread upon the Ground, they would have greatly interfered with the Drying. I have seen when this Caution of cocking up at Evening has been omitted, that the whole Quantity which was very forward in drying the Day before, has been rendered damp and soft, and brought into a worse Condition than at first; for the Water of the Dew is more hurtful to its Colour than the natural Juices of the Grass. In this Condition the Smell and Colour have been greatly impaired, and there has been afterwards no Way of recovering them. This is not so bad as the Practice of the remote Farmers, whose Hay is always brown, and Mow-burnt; but it is very much inferior to the true and careful Method, and never fails to reduce the Price.

In the proper Method of Hay-making after the Tedding, and Grass Cocking, so far as we have named, the Hay is to be spread again, and drawn up into a Kind of Lengths, which they call Windrows. This is a very good Condition for drying, and what is a great Advantage also, these Windrows are easily thrown up into Cocks, for they lie conveniently for that Purpose: thus when the Weather is fine, the Hay has the full Advantage of it, as it lies spread out in these Rows; and if Rain come on, the Hay-makers can toss it into Cocks in a few Minutes, in which Condition it will get very little Damage, and is ready to be spread again to take the Advantage of the next fair Blast.

From these Windrows the Hay is to be thrown into large Cocks, and in these to stand through the Night, and for some Time afterwards; but then it is not, though pretty well made, to be carried home directly from the Field in this Condition. The Outside of one of these large Cocks will be very dry, while there is Moisture in the Middle, and the Farmer's Business is to have his Hay all alike; not only some of the Juices of the Grass will remain in that which has been in the innermost Part of the Cock, but it will sweat a little with lying together: therefore these Cocks must be thrown

PLA. V of a FOUNDATION proposed for STACKING HAY upon, to prevent its •Firing, tho put up with more •Sap in it, or in a greener Condition than Ordinary: One •Stone of such Hay having more •Savourishment in it than two or three of the Common Sorts.



- A, A, A, A, ... The Circumference of the Foundation, laid with dry Stones or Brick, & raised only one foot above the surface of the Ground.*
- b, b, b, b, ... Four Cross Gutters, each one foot square in the Bore, meeting in the middle of the Foundation, to be all covered over with loose pieces of Wood or Stone as one of them is in the Plan for Example.*
- C, ... In the Center of Communication to all the four Gutters, place a Common Sack Upright with a round Bottom, stuffed with Straw, & as the Cock raises, draw up the Sack a foot or two, till it be quite finished a top; then draw out the Sack, & leave its Track open a top as a Vent to the perpendicular Flue; till the danger of overheating be over, when it may be covered over & Thatched.*

This greenish Hay beginning to heat, soon rarifies & expands the Air contained in the perpendicular Flue, which is continually expelled a top, and succeeded by the Indraft of the cool dense Air from the Gutters below so long as the least heat remains in the Cock, which will prevent firing overheating & slow-burning over much, especially if it be considered that no part of this Cock is distant above three foot from the ambient Air without or the Circulation thereof in the Center Flue.

When the Cock is cured, Thatched & quite cooled, the Gutters should all be stoped on the Outsides with Wisps of Straw, or the Hay will not keep so long & well as it might do, but if intended to be used in 3 or 4 Months after stacking, keep the Gutters open the whole time, but the flue a top must always be closed in at Thatching time.

Engraved for the Compleate Body of Husbandry, Printing by the Kings Authority in Weekly Numbers at 6d. each.

thrown to Pieces, and the whole Quantity of the Hay once more spread upon the Ground. If good Weather follow, it will thus dry in a very compleat and perfect Manner: three Hours Wind and Sun going farther under these Circumstances than a Day at another Time.

If the Weather continue favourable, the Business of Hay-making is thus happily finished; but if Rain come, we must give the Farmer his Lesson, which is, not to turn the Hay that has caught the Wet as it lay spread, but to let it dry as it lies, which, these Showers being seldom lasting, it will quickly do. On the contrary, if the over Care of the Hay-makers should turn the Grass thus nearly dried, and then wetted by Accident to the Ground, the Damp of the Earth would greatly injure it. On the other Hand, as the Wet is slight, and the Sun and Air have great Power; the Top will presently dry again lying as it is.

After this spreading from the Cocks, the Hay may be thrown together for Convenience of Loading, and is in perfect good Condition to carry in.

This is the whole Method of Hay-making, when every Thing has been properly managed; but, in other Cases, farther Care may be necessary; and we shall be defective, if we do not inform the Farmer in all possible Particulars.

We have directed him in preparing his Ground at the Approach of Winter, or, in the worst Case, early in the Spring to get up all large Weeds: and we have directed him in the Article of Hay-making, for a clean Piece of Grass Ground thus prepared. On the other Hand, when this due and timely Care has been neglected, more Time, and greater Caution will be required in the making of the Hay. When there are thick Weeds among the Grass, there must be more Time to dry the Whole than where the Grass is clean, for these have more Moisture, and are, consequently, longer in parting with it. And if the Hay be put up damp with them among it, there is no End of the Mischief, for they will give afterwards, and spoil every Thing near them.

In whatever Condition the Grass be, the more Hands are employed in making the Hay, the better; and a very careful Eye must be kept over them, to see they do their Duty.



CHAP. XII.

Of the Aftermath, and the Winter Use of Grass Grounds.

WE have conducted the Farmer from the clearing and preparing his Ground, to the making and carrying Home of his Hay; and we are now to suppose the Ground cleared, and to consider the Use it may be put to, during the remaining Part of the Year.

The Hay of the first or great Crop being carefully ricked, that Trouble will be entirely off his Hands. If the Weather be favourable, his Interest is to keep it till perfectly dry upon the Ground; but if it be precarious, he may stack it sooner, observing the Caution we have given

in one of our first Numbers of this Work, to keep a Hollow in the Centre of the Stack to prevent its heating.

In either Case the Hay being out of Hand, his Care is to return to the Ground from whence it was cut, and make the best Advantage of this he can.

In the more improved Counties where the first Crop comes early, they expect a second; and keep the Ground as carefully for this as for the first.

We have shewn it is an Error to suppose the old Stumps grow up into a new Crop, therefore that the closer the first is cut the better. This will, to the common Reader, seem against Reason, but we can assure him it is the Doctrine of Experience. If he will observe two Grass Grounds, the one of which has been cut close; and the other in a more careless Manner, with long uneven Stumps left on it, he will find the close cut Piece will yield the new Shoot quickest, and will keep above the other in Height throughout the Growth.

This is to make the second Crop of Hay: but, at the best, that is much inferior to the former; and, upon the Whole, the Husbandman is often in the Wrong to depend upon it.

None but good Ground, and what is kept very well in Heart, will afford a second Crop at all worth cutting; and even this not well, unless the Weather favours. At the best therefore, the Profit is but moderate, and the Hazard very considerable; so that in many Cases, it is better to use the Ground for feeding.

The Farmer who lives in a County where Manure is scarce, and where there is not all this nice and exact Care used about Grass Grounds, must not expect all the Advantages we name, to him who uses more Art, and more Expence in his Improvements. Thus, as it is not every Ground in the most improved Counties that will yield a second Crop of Hay to Advantage, so in the less improved Grounds, the Husbandman is not to expect one Crop every Year.

The Crop of Hay from the Grass Grounds, is like that of Corn on the plowed Land, it is the utmost the Soil is able to produce, and it exhausts it accordingly. Therefore as in the Counties where less Improvement by Manure is used, a Fallow once in three Years is allowed to recover the Heart of the Ground; in the same Manner in such Places, the Crop of Hay should be once in three Years spared to give Strength for the others.

There is some Advantage however in this, which may be called the Year of Fallow for the Grass, in that it is not altogether useless; for, though the Grass is not to be mown that Year for Hay, it may be eaten by the Cattle. There will be the more upon it for them, because the Heart is not suffered to run up to Head for Hay: and all the while their Dung as they feed upon the Ground, will be enriching and improving it.

This Matter of the Grass gathering Strength in the Year wherein there is no Mowing, will be perfectly understood by what we have before said of the Growth of Plants in general; which is in all of them thus. The Root supplies the

Leaves

Leaves with abundant Nourishment, while there is no Stalk. When that Stalk grows it demands a great deal, the Leaves therefore have less; and when the Seed comes toward ripening, all the Care of Nature is directed thither, that being the Intent in the Growth of the Plant.

Now this shews very plainly the Advantage of the Year of Fallow, as it may be called, to Grass Grounds, that is, the Year in which they are fed, not mowed. The Growth of the Grass into Stalk exhausts the Root, and starves the Leaves. This is what is suffered in the Hay Season, and it is therefore the Hay Crop exhausts the Land so much more than the feeding.

When a Piece of Grass Ground is kept a whole Year for feeding alone, the Stalks are eaten off as they would rise, and the Leaves being also constantly cropped, new ones are continually sent up in their Places; which being again eaten down before they are of a Size to exhaust the Roots too much, the whole Plant is kept in a Condition

of constant Vigour, and the Roots in Strength and Heart. The Ground also is less exhausted by the Growth, and all the Time refreshed by the Dung, so that there is every Way Improvement.

In this Manner the Year of Fallow is to be conducted in those Counties, where the Want of Improvement renders it necessary: with us the Aftermath is to rise to a new Crop for mowing, or to be eaten on the Ground, according to the Circumstances and Occasions of the Farmer.

In the eating it off, the larger Cattle are to be let on first, and Sheep afterwards. They will eat where the Oxen and Cows can find nothing more; and when the Ground is fed down in this Manner, it is to lie a few Weeks to recover, and then the Cattle are to be turned in again. This, with the Manuring and Dressing as we have directed, comprises the whole Management of Pasturage.

BOOK VII. PART II.

Of the Cultivation of artificial Grasses.

CHAP. XIII.

Of artificial Grasses in general.

WE have observed already, that these are principally of foreign Origin, and all of them are to be sown and raised by Culture, none growing naturally wild in whole Fields, as the common Grass does, which is therefore called natural, in Distinction from these raised by Art and Culture.

As these several Kinds are mostly of foreign Extraction, the Method of Culture is also copied from Abroad, but we have greatly improved it. 'Tis the Character of the ENGLISH to receive and adopt the Productions of other Countries, and to make them our own by our Improvements. We have in no Article done it more than in this of the foreign Grasses; the Seeds of which we have from Abroad, and raise artificially here, whence their common Name.

There are often Reasons why it may be proper to take a Piece of Ground out of Corn, and sow it with some of the Grasses. This used to be done in the old Husbandry, with the common Grass Seed, but at present the Custom is by some of these Kinds, and the Profit four, five, or more Times greater.

There are the greatest Reasons for varying a Crop from time to time. And these answer excellently for that Purpose, giving the Land an advantageous Kind of Fallow, while they at the same Time afford a very profitable Produce.

The Husbandman sees often the Advantage of sowing Corn or Pulse, where Grass would hardly grow, but this is raised at an Expence of Manure

and Tillage, and lasts no longer than one Season: these Grasses will in the same Manner grow, with proper Management, on such Ground as will not bear common Grass; and they will also follow Corn when it has quite exhausted the Land, very successfully.

The Reason of this we have given before, which is, that Corn rooting very slightly, can exhaust only the superficial Part of the Soil, so that these which go deeper find Nourishment: and at the same Time fallow and improve the upper Part, which will be wanted for Corn again.

We have shewn that the Pulse Kind all are Improvers of Land by this Means; by shading the Surface and mellowing it, while they draw but little Nourishment from it; but these Grasses do much better, they cover the Surface more closely, so that there is more Advantage to the Ground, and they penetrate deep for their Nourishment. They differ from Pulse in this, that they require a great deal of Food, but then they take it from such Part of the Ground as is not called upon for Culture.

Every thing that enriches Land acts upon one of these two Principles, as Manure or as Fallow. The Manures give a Fertility from themselves. The Fallow leaves the Ground open to receive it from the Air: but it will even get it any where so it have Rest.

We see in Gardening that when much Manure is not used, the Ground is to be trenched once in two or three Years, to make it fruitful. This trenching is changing that Part on which Plants stood, and from which they received Nourishment. They dig to a Depth sufficient to raise a new Parcel of Mould, and they bury the former Surface in the Hollow from whence they throw up

up that. In the same Manner these Grasses act, though under a different Form, and indeed every Way more successfully. In that Case the superficial Earth wherein the former Crop grew, is thrown under the new Surface, where it gathers fresh Strength, and will be fit to nourish Crops again. In this Case of the Grasses, that under Part of the Soil, instead of being thrown up, is exhausted by Plants, whose Roots go down to it; and the upper Part lies at rest, or at least with very little Demand of Nourishment from it, and is all the Time sheltered by the spreading Branches of the Crop; and enriched by the Dews and Rains; and occasionally by the Dung of Cattle fed on the Growth as it stands.

This is the System of Improvement by artificial Grasses; and in this Account it is plain, that the Practice of the Field exceeds that of the Garden, as the Success indeed evidently confirms.



C H A P. XIV.

Of Clover, its most proper Soils, and the Manner of sowing.

WHEN we spoke of the artificial Grasses, as being the natural Product of other Countries, we made a Reserve in Favour of Clover, by saying only, they were so in general. As to this in particular, it agrees in the Manner of raising and cultivating with the rest; and we have the Seed of some Kinds from Abroad; but it is in its Origin a Native of our own Country. The common red Trefoil, vulgarly called red Honey Suckle, is Clover in a wild State; and there is no other Difference between that and what we raise by Culture, but what the richer Soil and Addition of Dressings has originally made.

Clover, and the other Plants raised under the Name of artificial Grasses, have not the least Resemblance of Grass in their Form, or Manner of growing, the Use they serve in supplying the Place of Grass, is what has occasioned their being called by the same Name.

Clover is a low Plant, and naturally grows leaning on the Ground. The Roots are fibrous and whitish, some few small ones spread under the Surface, but the greater Part penetrate straight down. To draw up a Root out of common Ground, one would suppose it did not go down above two or three Inches; in a well manured and well tilled Field, where the Earth is light and mellow, the longest Fibres carefully drawn, will measure about six Inches; but they may be traced with Care to fifteen or eighteen Inches; and do really penetrate much farther, but that they are then very fine, and scarce to be distinguished.

The Stalks, when Clover is well supplied with Nourishment, are numerous, jointed, and spreading. The Leaves grow from each Joint of each Stalk, and many from the Root. Each Foot Stalk has three upon it, and they are often spotted in the Middle. The Flowers are red, and stand in little Tufts or Clusters, at the Tops of the Branches. They are of the Shape of the Pea Blossom, but very small, narrower, longer,

and not so open; and the Seeds are contained in a Kind of little Pods. There is a Drop of a Honey-like Juice at the Bottom of each Flower; whence it obtained the Name of Honey-suckle, a Name given also by many to the Wood-bind.

This is the general Description of Clover; which differs according to the Degree of Culture in Bigness, and the Form of spreading or standing more erect, but not otherwise. The wild Honey-suckle, which is common wild among the Grass of dry Pastures; is an Advantage to it. This is low and small, and in a great Measure lies down upon the Ground: in Fields where it is sown, and carefully cultivated; and is raised from Seed that was got from cultivated Plants, it is larger and more erect. The Leaves also are larger, and so are the Heads of Flowers, and the separate Flowers in them. We have also what we call the Iron Clover, which is very sweet and less than this, but it differs no otherwise than from the same Kind of Accidents. The Dutch and FLEMISH were the People who taught us the Use of Clover, and they raise it to a great Advantage at this Time, the Quantities they sometimes obtain from an Acre being too great for the Credit of those who have not seen their great Care and excellent Management.

With Respect to the Soils for Clover, the richest always succeed the best with it, and there is none so good but it may be worth while to raise Clover upon it. There is Land too rich for Corn; for it will make it too rank, but this will excellently nourish Clover; and on the other hand, it is a bad and ignorant Practice to sow this Species on poor Ground, for it will never come to any thing.

Whatever would be needful to do to such Land to suit it to the bearing of Corn, the same will be necessary to make it bring Clover to good.

In all this we mean only to shew what is necessary for Clover, but we shall inform the Farmer, that in the common Course of Things it is not to be sown on rich Land new broke up; or on such as has been dressed and prepared purposely; but is to follow Corn as we have mentioned before, and will then serve in the double Capacity of yielding a rich Crop itself, and preparing the Land for Corn again.

As to the different Kinds of Soils, the best for Clover is a light, warm, and rich Earth. Such as is principally what we call mellow Earth, but with a Portion of somewhat loamy, for otherwise the pure mellow Earth alone is apt to lie too heavy for Clover.

A very rich Loam is an excellent natural Soil for it.

Whatever Land be designed for Clover must be brought into perfect good Tillage, and for this Reason it very well follows Corn, as in that Case it comes upon a Land which has been well wrought, and with Respect to the Nourishment it requires, is not exhausted. This we have explained already.

If the Farmer should chuse to break up a Piece of Ground on Purpose for Clover, the Freshness of it will make that Growth succeed, though in its Nature it should be improper. As to other

Soils different from those we have named; if the Farmer finds it convenient to his Affairs to use Clover upon them, he must manure them accordingly. Marle, Dung, Lime, or the other Manures in general, which are used to prepare Land for Corn are also the proper, and they are the only Methods of preparing it in this Case for Clover.

The common Custom of sowing it with Corn is liable to some Objections, but they may be got over by a proper Management, and then this will be found a profitable Method.

Nothing is more common than the sowing Clover with Barley, in which Case it is apt sometimes to over-power the Barley in its first Growth, and will then do it great Damage. In a wet Summer the Clover will grow at a great Rate, and the Damage of the Barley will be very great this Way; and on the other hand, in a very dry Summer it is too apt to fail.

To prevent the Damage of the Barley by the Growth of the Clover, the best Way is, though they are sown on the same Ground, not to sow them at the same exact Period. When the Farmer intends to have a Crop of Clover and Barley upon the Ground at the same Time, let him sow the Barley alone in the usual Manner, and wait till it is three Inches high above the Ground: then let him sow his Clover by Means of a Hand Drill. This will answer the Purpose extremely well. The Clover will do better than when the Seed is scattered at Random; and not the least Damage will be done the Barley, by drawing the Drill by Hand through the Field, the Person entrusted with the Work being tolerably careful.

In this Way the Barley will have got so much Head before the Clover shoots, that it will be too strong to be over-powered and starved by it; and at the same Time, if the Season prove dry, it will be high enough to defend the Clover, which otherwise, in a wet Summer, would have over-powered it.

We have said that Clover may be sown alone, but when it is judged more proper, as is commonly the Case, to sow it with another Crop, Barley is not the only Kind: it may very well be sown with Oats.

When a Crop of Corn is to have Clover among it, less Seed should be used than if it were to grow alone, and as to the Manner of sowing it, if that be done by Hand with the Corn, there should be chosen a fine mild Day for the Purpose; because the Seed is so light that otherwise it would be blown about, and left on the Ground in a most irregular Manner. But the best Way by far is, the drilling it in afterwards.

The Time of sowing it must depend upon that of the Corn with which it is to be sown; and in this Case the little Time after is very well worth while waiting, for though it keep the Clover back, it brings the Corn forward: on the other hand, if the Farmer be desirous of having a Crop of Clover early in the Ground, though sown with Corn, the best Method is to sow it with black Oats, and get them in as early as possible.

The Spring Corns are not the only Kinds among which Clover may be sown. It will thrive very well with Wheat and Winter Rye, if sown with

them in the Beginning of OCTOBER. Indeed there are Advantages attending this Method, that are to be had with no other. We have observed that a dry Summer hurts a Crop of young Clover extremely. There is no Plant that more requires Rain in the Time of its first shooting, for some Months. It is for this Reason that when sown very early with black Oats it always thrives, because it has then the Advantage of the Rains of Spring. But when it is sown in the Beginning of Winter, with Wheat or Rye, it fares still better, for then it is sure to have a long Time of wet, before there be any Sun or Drought to hurt it. In this Case also it strengthens itself in the Ground extremely, and is always found very thick and flourishing on the reaping of the Corn.

Some might be apt to fancy that a thick Crop of Clover growing among Wheat, in this Manner, would impoverish that Grain, or be impoverished itself, because of the great Quantity of Nourishment it requires; but we have shewn already why they do not interfere with one another, the Wheat rooting superficially, and the Clover deep.

When Clover is sown alone OCTOBER is the most preferable Time, though the Spring be commonly chosen. Very severe Weather may hurt it, as it will almost any thing, but Clover being a Native of our Country, is not a very tender Plant: if the Winter be tolerably mild it will make very vigorous Shoots, and strengthen itself in such a Manner in the Ground, as to yield a very early and very plentiful Crop in the succeeding Summer; after which it will continue firm in the Ground, and encreasing in Value. There is also this particular Advantage in sowing Clover in OCTOBER, that it comes up in a Manner free from Weeds, whereas in Spring they rise in Abundance among it, and many of them being of quicker Growth, they will over-power it.

Many, when they are about to lay down a Piece of Corn Land for Grass, chuse to sow it with Ray Grass and Clover; but in this Case the best Method is to sow them at different Times, though they are to grow together afterwards: thus the best Corn for sowing with Ray Grass and Clover is Wheat, and the best Way of doing it is this. The Wheat being sown at its natural and usual Time, let the Seed of the Ray Grass be sown with it; this will be naturally sometime in OCTOBER; and let the Clover be sown in the following Spring. This must be done early, that the Clover may, during its first Growth, have the Advantage of the Rains of the Spring, and be got to an Height in Summer.

There is also, in the common Way of Husbandry, another Reason for sowing it very early in the Spring in this Case, which is, that nothing more can be done as to the Covering it at that Season, but rolling the Field; now rolling, while the Corn is very young, will help it; but if it should be done when it has got into Stalk, it will hurt it extremely by breaking the Stems, which very difficultly recover such an Injury, after they have arrived at any Strength. This we have explained at large in a preceding Part, under

under the Article of Rolling; and therefore need enter no farther into the Matter here.

But we shall add for the Information of the Farmer on this Head; that when he thus sows two Grasses with his Wheat, he is to let in the last in the same Manner as with the Barley, if he will follow the most reasonable Practice. Thus let him in this Case sow his Ray Grass with the Wheat in OCTOBER; but when he comes in Spring to sow his Clover, let it not be done in the common random Way by Hand; but let him use the Hand Drill, and sow the Clover just as we have directed when it is to grow with Barley.

As to the Damage that the severest Winter can do to Clover, it is not nearly so great as that of a dry Summer to such as has been sown late in Spring. If the Roots be tolerably covered, and the Soil lie any Thing close about them, they will get no Harm; and for that Reason when the Farmer finds Danger of the Winter, with respect to a young Crop of Clover that is alone, his best Method is to turn in his Sheep to eat it before the Approach of the severe Season. The Leaves and Stalks which would have been perhaps in a great Measure destroyed by the Frosts, and long lying of Snow, will have answered their Purpose, and been eaten; and the Root being better secured than before, by the trampling of the Cattle, which fixes the Ground about it, will stand perfectly well; and having no Head to support during the Winter, it will send up its Leaves and Stalks vigorously in the Spring.

The Husbandman thus understanding the Nature of Clover; the various Manners of sowing it, and the Reasons for each: is to consider next the Nature and Quality of the Seed; and to take Care that he chuses such as is new, and of a good Kind. Among the several Quantities of Clover Seed offered to sale, the Husbandman will find a great deal of Variety of Colour; some is yellowish, some redish, and some blackish. These are three Colours that are to be his first Guide in the Choice; the yellowish is the best, and to have the true Tint, this should be a greenish yellow; the redish is the next good Colour, that which is black is worst: but the Colour is not all that goes to the Choice, it must be sound and fresh.

It should be clean, large, and glossy on the Surface, which is always a Proof of its Goodness, as a dusty heavy Aspect shews it has been damp, or has had Insects in it. The Seed being understood as to its Marks of Goodness, the next Consideration is the Quantity; about this there is much Dispute among those who have most Right to know, that is, the practical Farmers. Some say six Pound is enough for an Acre, others use twelve or fourteen Pound.

In general, we see the Practice is wrong in allowing too much Seed; but those who use this smallest Quantity err on the other Side, for six Pounds is too little. Clover is a Plant that never grows to any considerable Size; when it is best planted it is but small in Comparison of other of the artificial Grasses, therefore the Plants are not to be kept at that Distance which the others be with Advantage. Eight

Pounds of good Seed is as little as should be allowed to an Acre in any Condition; and those who go beyond ten, allow as much superfluous; as those who sow but six too little; nine Pound may be called a good Quantity: and notwithstanding all I have heard, to speak from what I have seen, are repeated Trials; the largest Quantities yield not only the smallest, but the worst Crop.

This is a Consideration of the more Consequence to the Farmer, in that too many of those who have written to instruct him, run into the common Error, and say, that a very large Quantity of Seed, larger than the most I have named, will yield him so much the larger Crop. This has been the general Error: the sowing too sparingly is an Error also; and though it cannot be attended with ill Consequence in those Plants which will grow to a very large Size; or send out numerous Stalks, with Ears on them, as in Corn, yet in Respect of Clover, and all the like Kind, it may defraud the Farmer doubly; first in preventing him from so good a Crop as the Land would very well have borne; and next in not doing the expected Service in preparing the Ground for Corn afterwards; for this cannot be perfectly done, unless it be entirely covered.



CHAP. XV.

Of the feeding Cattle on fresh Clover.

THERE are two distinct Uses for which Clover is sown; the one is, the feeding Cattle upon it as it grows; and the other, the laying it up for Mowing, for the making it into Hay: in this it perfectly resembles the natural Grass, and answers both these Purposes in the same beneficial Manner. But there must be Care in the feeding it on the Ground, otherwise it may be attended with Danger.

We know that the richest Foods on our own Tables are capable of doing us the most Harm. They will often breed Distempers in us, and Cattle are no more exempt from them than we are.

Clover is a very rich Food for them, and they are so fond of it, as to eat of it often immoderately; wherefore unless Care be taken, especially when the Clover is rich, and they are suddenly turned into it, they will get Disorders. The Quantity and Richness of the Nourishment that is in Clover are such, that an Acre of it will, on a moderate Computation, feed as many Cattle as six Acres of the common Run of Pasture Grounds: but, in order to make the most of it, they should not be turned into the Field to trample it down at random; but it should be mowed fresh and fresh as it is wanted, and given them green in Racks. As to the mowing it for Hay, that is a quite different Consideration, and will be treated off in a distinct Chapter.

The Danger of Cattle being turned at random into fresh Clover is, that they will eat of it till they burst. For this Reason it is best to feed them with it fresh mown, in proper Quantities

first,

first; that they may be a little used to it, before they are turned in to take their fill. The Novelty of the Taste is one Thing that recommends it; and they are like Children in the Shop of a Grocer, whose only Danger is till they are used to the sweet Things; after which they will not eat to hurt themselves.

Some Consideration must also be had as to the State of the Cattle, for some will bear a rich Nourishment better than others; and as for such as seem to be most likely to receive Mischief from it, the best Way is to give them Straw with it at first; and bring them to the rich Food alone by slow Degrees. This is an Article that will be better explained when we come to treat of the Disorders of Cattle, and the natural Regulation of them in Point of Health.

When they are turned into the Field of Clover, it should be done gradually; and this Rule holds good concerning those which are well enough to be trusted in at once, as well as such as must have this Preparation.

The right Method is first to turn them in about the Middle of a hot Day, when they have eat before, and the Leaves of the Clover are a little flagged. The great Danger of this Food is, when it is eaten in too great Quantities, and when the Dew is upon it; therefore Care being taken as to the Dryness of the Clover, the next Article is the not suffering them to eat too large a Quantity. They should be suffered to be in the Clover but Half an Hour the first Day; the next Day they should be turned in at the same Time, and left an Hour, and so on till they are accustomed to it: this we have observed generally before, speaking of the Horse and its Food, but it is proper to be more particular here.

Some Regard is to be had to the Weather in this Respect; for Experience shews, that Clover is very apt to damage Horses in wet Weather, and much less so in dry. We have before spoke of the Danger of letting Horses eat of it while the Dew is on the Leaves. Any wet with Clover makes it more dangerous than when dry, and it is from this that the Caution rises.

It is also for the good of the Clover, as well as of the Cattle, to keep them off in wet Weather: their Feet are apt to do a great deal of Harm at any Time, but they will do most when the Ground is most damp.

The Addition of Ray Grass to Clover is very advantageous in all Respects, and in none more than this of Health to the Cattle that feed upon it. This Ray Grass is more of the Nature of the common and natural Grass of our Pastures, which is their proper Food; therefore being mixed with the other, it tends to correct its Richness; and, in some Degree, answers the Purpose of Straw, which we have said is proper to be mixed with it. Then at the same Time that it renders it more wholesome, it increases the Crop in Quantity, for this spreads under the Surface at the Root; whereas the Clover penetrates down deep, so that they grow as well together as the Corn and the Clover; and the Quantity is vastly increased upon the Ground; for the Leaves grow together as naturally and as

well as the Roots, standing no more in one another's Way than they do. The Clover spreads in an open loose Manner, and its Branches shelter the Ground where the Roots of the Ray Grass stand, so that it is moist and full of Nourishment; and, in the mean Time, the narrow slender Leaves of the Ray Grass rise up and appear through the Clover, without any Difficulty or Molestation. Both these grow together; and are fit to be mowed together for drying, or to eat together on the Ground: but there is this Caution to be given the Farmer, that Clover and Ray Grass do not serve the Purpose of preparing the Land for Corn any Thing nearly so well as Clover alone. We have shewn how a Crop of Clover improves the Ground, which is, by sheltering the superficial Part, and drawing its Nourishment from some Depth; so that the upper Part, while it gets sheltered, is unexhausted: but this is only to be done by Clover alone, for Ray Grass roots shallow as Corn does, and therefore the Ground is, in some Degree, exhausted where the Corn is to get its Nourishment.

We do not speak this so absolutely as if Ray Grass was never to be mixed with Clover, where Corn is intended to come afterwards. We give the Farmer his full Instructions, and he will know by this, that, in general, Clover alone is proper to be sown where the Land is soon to bear Corn again; but, on the contrary, when it is intended to lie longer in Grass, then Clover and Ray Grass together. When Ray Grass is mixed with Clover, where Corn is to follow soon, the Quantity of the Ray Grass must be but small; whereas when the Ground is to lie long in Grass, the Quantity of the Ray Grass should be large. This is the whole Instruction in general Terms, and this the Farmer must, on every Occasion, suit to his present Circumstances and Situation.

Cows are subject to Disorders from Clover as well as Horses; and when it does not take this Effect, it injures their Milk in Flavour, and is prejudicial to the Productions of the Dairy. This Accident is also greatly abated by mixing Ray Grass among the Clover in Sowing, for this being nearer the natural Provender of the Cow, takes less Effect upon her than with the other. The common Grass of our Pastures has frequently the wild Clover, we have named among it; so that there is no other Difference between a Field of Clover and Ray Grass, and one of our common Pastures, where there is a large Share of Honey-suckle Trefoil among the Grass; but that the one is a Mixture of Grass and Clover, in which the Grass has the larger Proportion; and the other is a Mixture of the same Things, in which the Clover has the largest Part.

Clover, though it is a much more lasting Crop than any of the Pulse Kind, which are sown for the same Purpose of improving the Ground, yet is but of a certain Duration, and that not equal to Saintfoine, or some other of these artificial Grasses. In general, Clover will last well enough three Years; but after that it declines so greatly, that it is not worth the continuing it upon the Ground. It is not that it will

will have exhausted the Ground so, that it cannot be made to grow on it again without Culture, and due Preparation. Therefore the Farmer at the End of three Years, must, in the common Course of his Practice, plow up the Land again: if he design it for a different Crop, he will find it very well improved and fitted for it; if he intend to continue the Clover longer upon it, he must sow a fresh Parcel of it after good Plowing, as he did the first, and it will stand three Years more very well in the same Manner.

We say the common Practice requires this; but it does not follow, that the Thing is in itself absolutely necessary. For it might be much otherwise in another Manner of managing the Crop.

We have shewn that on certain Occasions, common Grass requires its Year of Rest from the Scythe; and in the same Manner, if Clover on the third Year were not to be mowed, but only eaten, it is highly probable that it would recover itself so as to last longer. This I have seen tried where it answered moderately well, and the Soil was but indifferent; it is an Experiment very well worthy to be made, where there is better Ground; and the Farmer has the full Advantage. By what appears already, it seems very likely to answer well.

The Dutch, who save every Thing, were the Inventors of the Custom of cutting the Clover green, and giving it to Cattle in the Racks, instead of turning them into the Field: and beside its not subjecting them to Disorders, there is a great deal of Frugality in this Management; and the Difference between thus using it green, and in the Hay are very great, for scarce any Thing loses more in drying.

In those Places where Clover was first given in this Way to the larger Cattle, it was discovered that Hogs are very fond of it: they were seen, and always are still when they can get at it, feeding greedily upon the Refuse that falls from the Racks. This led to the trying them with Clover; and it has been found a very excellent Food for them. Some have gone so far as to propose very extravagant Profits from this Use of Clover; but without believing such Accounts, or trusting to such Calculations too strictly, there may be great Advantage in feeding them with it in a proper Manner.

The Benefit of feeding Cows on Clover would be much more regarded, were it not found to give a Taste to the Milk; but the Farmer when he sees an Inconvenience, is not to sit down as if it could never be remedied. In this Case the Cure is very easy, it is only the not letting them feed entirely upon the Clover. Every Body knows that the natural Food of the Cow is the common Pasture Grass; therefore as the Clover is not so natural, it should not be given alone. When the Ray Grass is mixed with Clover in the Sowing, the whole is more proper for Cows, than when the Clover is sown singly; but, in either Case, the best Method is to feed them in Clover during the Day, and to turn them into a common Pasture of natural Grass in the Night: this gives them a Mixture of the common with the richer Food, and their

Numb. XXXVII.

Milk, while it is rendered very abundant by the Use of the Clover, is kept to its common Taste and Qualities by the other Grass.

The Reason why Clover will not succeed so perfectly in the feeding of Hogs, in the Manner those propose who have projected that Improvement is, that when they are turned loose into a Field of it, according to that Proposal, they destroy and taint it with their Dung and Urine, after which they will not eat it freely. This, beside the Quantity they tread down, is so great a Disadvantage, that I have seen frequently, where Hogs have fed plentifully, and thrive extremely upon it for a Time after they were put in, they have afterwards pined away, and grown miserably poor. It is not that the Clover does not agree with them after a Time, but that they have spoiled it, and don't like it any longer in that Condition. 'Tis certain, that by feeding them with it properly, it would be an excellent Improvement upon the common Methods in that Respect.

Sheep are also fed very advantageously with Clover: they will eat it with equal Freedom fresh, and in the Condition of Hay; and it is of vast Service in the breeding up of House Lambs, which, in the Neighbourhood of great Towns are so profitable an Article. The Ewes feed on it in Summer in the Field, and in Winter on the Hay under Cover; and there is no Food that supplies them with such Plenty of Milk, or such as is so fit for the nourishing the young.

The Farmer who manages with Prudence, will find this a vast Article in the feeding of his Horses in Summer and in Winter; the Grass and Hay being equally proper, under a right Management. And beside the Advantage he receives from it in respect of his Ewes and House Lambs, his Weather, Sheep, and Grass Lambs will very well fatten upon it; and the Store Sheep may be supported on it during the Summer.

These are such important Articles in favour of Clover, that when they are named together, he must be a very poor Husbandman who does not see the Advantage he will find in sowing it.

Beside the several Methods of Sowing it, which we have named alone, and with the different Corns; some have sowed it with Pease, and others with Horse Beans. In the first Case, the Pease are very apt to spoil the Clover; but there are Occasions in which it is proper. The Beans, as they do not lie upon the Ground in the Manner of the Pease, are not liable to the same Objection; but then the Preparation of the Land for Beans being less than for Pease, and the Clover requiring a very well tilled Land, this does not succeed so well. When the Change of Crops renders it necessary, these Things may be done; and some Time may be saved by a Crop of Clover, in which the Ground otherwise would be idle; but these are accidental Considerations. The proper and profitable Methods are those we directed in speaking of that Article, either with Clover alone, with Ray Grass in the common Method, with Barley or Oats, or with Wheat.

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We have entered at large on the Use of Clover as it grows; we are now to consider it in the Condition of Hay, with its several Uses.



CHAP. XVI.

Of the mowing of Clover, and its Hay.

THE Farmer is to compute according to the several Circumstances of his Stock, and his Ground; how far he shall want the Assistance of his Clover green, and how far in Hay. We have observed that the Mowing it every Year is a Practice which might occasionally be let alone to Advantage; but the Growth is so strong, that it may also, where Circumstances suit, as they usually do, be mowed more than once in the Year.

The first Time of Mowing is toward the End of MAY. The Root has been by this Time well strengthened in the Ground, having stood through the Winter; and the Shoots are numerous and strong. The Farmer is now to look well upon it for the proper Season, for it is not in the Nature of these Things to allot any certain Day of the Month. It is a particular Condition of the Plant that gives it a Propriety for Mowing, and this may happen according to the Soil, Season, and many other Accidents forwarder one Year, and backwarder another; and earlier in one Crop, and later in another the same Year.

We have told the Farmer the latter End of MAY is the usual Time of Clovers coming fit for cutting, and that it may be sooner. He should therefore begin to look upon it in the Middle of MAY; and observe in what Condition it is with Respect of flowering. As we have told him respecting common Grass, we may add on this Head, that the Time when Clover is fittest to be cut for Hay, is just when it is getting into Flower, that being the Period of the Growth, in which the Leaves and Stalks of all Plants are fullest of Virtue. This we speak of Clover with Respect to the cutting it in MAY or thereabouts, for Hay alone. There comes a farther Consideration afterwards, when it is cut at a proper Time of the Year for Seed.

In this MAY or first Crop therefore, the Farmer is to consult only the Richness of the Stalk and Leaf, and to find when that is at its greatest Perfection, he is to examine the Heads with respect to their flowering.

The Flowers of Clover grow in small Tufts, or roundish Heads, at the Tops of the Branches, and these appear there in form of roundish, green, hairy Buttons, some Time before the Flowers begin to open. The Farmer is to watch the Appearance of these, and to observe how they gradually come toward Ripeness; and he is to send in his Mowers just before they begin generally to blow. A few will make a Shew here and there in the Field, while the rest are exactly in their right Condition; for there is no Plant in the World, a whole Field of which

gets into flower all together. This is his Time for setting to work in Mowing, when all the Plants are full of Heads, and some few of them only have begun to open into Flowers. Let him perfectly comprehend the Reason of this Conduct; it is the more needful to explain it to him fully, because several have erred in the Respect of letting the Clover stand too long for the first Mowing; and they think still in many Places, they ought to see it in full Flower all over the Field before they begin.

The Intent of the Farmer here is, first, to get a Crop of rich Hay, and next to have his Clover Roots in a strong and vigorous Condition; for their shooting quickly and strongly afterwards, is a Thing of great Consequence to him.

We have shewn that the Time when his Hay will be best of all, is when it is just getting into Flower, and this is a Time at which it has not exhausted the Roots: this is a very material Consideration. If it be cut just at that Period, the Roots are in full Vigour; and having lost the large Head they had to support, will push out their Shoots with a surprizing Strength; but if the Plant have been suffered to stand till all of it be in full Flower, and some getting into Seed, which happens very soon afterwards; then the Store of Nourishment that has been called up, has, in a great Degree, exhausted the Roots, and they will grow very poorly afterwards for some Time.

Therefore as soon as all the Plants are knotted, or have the Heads formed at the End of their Branches, let the Crop be cut; and let the Mowers have Caution given them to cut it as even as possible, for this greatly forwards the Growth of the new Shoots. When cut, it is to be managed exactly in the same Manner as common Grass, and so made into a dry, firm, and sound Hay. The Farmer must not be surprized at his Clovers shrinking in the drying, for that it always does in a very particular Manner, its Branches falling together, and the Whole getting into a very small Compass, compared to what it filled while growing.

Great Care is to be taken thoroughly to dry this, because having a great deal of natural Moisture, it will otherwise be very ready to become damp afterwards, and by that Means to decay. Being cut at this proper Growth, and carefully managed in the making, it will be an extremely rich and wholesome Food for the fattening all Kinds of Cattle. When it has stood too long upon the Ground before the first cutting, it not only impoverishes the Roots, but the Hay itself is too rank, and has not the excellent Qualities of this first Crop when made in Perfection.

After the mowing this Crop the Land is to rest, and occasionally it may be mowed again once, toward the End of Summer, or twice: the former Time in JULY, and the other toward Autumn. There may be Reasons for cutting three Crops of Clover; for different Farms are situated and circumstanced variously; but to speak in general, it is not what the Farmer ought to make the Rule of his Practice. Very often when three Crops are cut, there is not Weather for making the

the last tolerably, for we have observed that the Clover requires good Weather, more than common Grass, because of its juicy Nature; which will easily contract Damage. At best, when the Season favours most; the second Crop impoverishes the third, and seldom gives it Time to ripen.

We have said any particular Farmer's Affairs may make Variations from all general Rules necessary; but in the common Run of Things the Advice that is most profitably to be followed, is to make but two Crops of Clover Hay; and this is very material, when one of them is intended for getting of Seed, which is very proper: in this Case there requires a Time for the Crop to ripen thoroughly, which it will rarely do when two have been cut before.

We shall consider the last Crop of Clover in the Summer, to be intended for Seed; and in this Case it must stand a good while. The Owner must look in upon it from time to time; and watch the Season of its Seeds being ripe. He must wait for this with Patience; and he may wait without Fear, for this is not one of those Crops, the Seeds of which are apt to shed.

If the Clover have been well managed, the Seeds will begin to appear in the Husks toward the End of AUGUST, sooner or later, according to the Soil, Season, and Manner of sowing: from this Time it will take between three Weeks and a Month to be thoroughly ripe: and when it is in that Condition the Stalk will begin to grow brown. This is the Case in all Plants, and this is the Time for mowing it on this Occasion. When the Stalks are grown brown or yellow, and on opening the Husks the Seed is found to be yellowish, the full Time of cutting it is come, then the Farmer is to take the Advantage of a good dry Day, and get it down. It is then to be made with Care into Hay, but this does not require all that Length of Time that a Crop does when the Stalks and Leaves are fuller of Juice. When dried it is to be laid up, and to be kept in the Straw in Spring.

Toward the latter End of MARCH it is to be carefully thrashed and separated from the Straw. After this the husky Part is to be well dried in the Sun, and then thrashed again; after this second thrashing it should be spread for a farther drying, and then worked about with Rakes, and rubbed thoroughly in the Hands, and by this Means a great deal more Seed may be got out of it.

By the Difficulty that the Farmer will find in getting the Seed of Clover clean, he will learn not to be afraid of letting it stand in the Field till thoroughly ripe, for otherwise it will never separate tolerably; and he may be sure there is no great Fear of Waste, in a Seed that is thus unwilling to leave the Husk at any Rate.

Two Bushels of good Seed will generally be had from an Acre of Clover, well managed and well thrashed: this is the nicest Affair in all thrashing, so that the Farmer must see to get a Person who understands it: such a one will do four Times the Business of another.

The Difficulty of getting the Clover Seed clean from the Chaff, has induced some to prefer sowing it in the Husk, and there is no great Danger of its succeeding, provided it can be di-

tributed properly on the Ground; but, as the Wind is apt to have too much Power upon Clover Seed, in the common Way of sowing it, when it is clean and free from the Husk, it must necessarily have more this Way, and there will be danger of its blowing into Heaps in some Places, and leaving others vacant.

This Objection is only of Force against the common Way of sowing; but where that is done by the Hand Drill, as we have advised in the sowing Clover with Barley, it may as well be used Husk and all, for it may be laid in with the same Regularity as if naked.

The Seed of Clover the first Year is better than any other, but it will grow very well the second; after this it is hazardous trusting it, a great deal of the Seed miscarrying.



CHAP. XVII.

Of the Soil for Saintfoin, and its Growth.

IN the Part of this Work regarding the Drill and Horsehoeing Method of Husbandry, we gave an Account of Saintfoin, as an Instance of one of the Crops to which that Practice is suited; having therefore occasionally and necessarily given an Account of the Nature of the Plant there, we shall not repeat it in this Place; but consider the Advantages of that Crop, and its Method of Culture according to the usual Ways of Husbandry.

Two Articles give Saintfoin the Preference against Clover; these are, its larger Size and its longer Continuance in the Ground. Clover, we have shewn, lasts properly but three Years, Saintfoin will last four Times as long; or more than that if necessary. In order to keep Clover a little longer upon the Ground without fresh sowing, the second Crop must be given up as to mowing; it must stand to Seed after the first Crop: and when the Seeds have scattered themselves, Sheep must be turned in to feed upon it. This is a Method attended with evident Disadvantages, and is often inconvenient: Saintfoin requires no such Management: let a Ground be once well covered with it, and it will take Care of itself afterwards; when it is thought fit to plow up the Land, Corn thrives excellently upon it: the Method of doing this, we have shewn already, in speaking of the various Methods of Tillage.

As to the Soil proper for Saintfoin, any thing will do except Chalk; this it naturally abhors; but on very poor, stony, and sandy Grounds it will do very well: and though a Plant that naturally roots very deep, yet it will thrive where the Mould is but shallow: its deep rooting is a great Advantage where there is Compass for it, for this makes the Leaves of Saintfoin look fresh, and serve excellently for the Cattle; when all others are parched with a Drought in hot Summers. The Sun can take no Effect upon a Root that goes so deep; and it always finds Nourishment there, while the superficial Mould in which Clover, and such other Things are rooted, is scorched and dried up.

Saintfoin is an excellent Crop any where, but it

it will answer the Farmer's Purpose best of all in those Places where Manure is scarce: it may therefore be considered as one of the best Crops the Farmers in the remote Countries can take into their Hands. They need not be afraid of a stony Bottom under the shallow Mould in these Places, as that is a common Condition of much of the Land there, for the Saintfoin will push its Roots through the Cracks that there always are in Beds of Stone near the Surface, and by that Means find Nourishment lower, where one would not suppose the Roots of any Plant could reach.

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C. H. A. P. XVIII.

Of sowing Saintfoin, and managing it while on the Ground.

Saintfoin so far partakes of the Nature of Clover, in Respect of the Farmer's Concern, that it may be sown either alone or with Corn; or it may be sown entire, or with a Mixture of Ray Grass. But this latter Method is not of that Advantage that is in the Case of Clover, for Saintfoin is very well able to fill a Land alone, and it has not the Inconveniences that attend Clover, in disordering the Cattle which feed upon it.

The most usual Way among our Farmers at present is, to sow Saintfoin with Barley, and this in the common Method of Husbandry, is a very successful Practice. The Method of doing it most advantageously is this, let the Ground be plowed three Times, to get it into a very fine Condition; for as Clover requires this, in order to produce a tolerable Crop, Saintfoin renders it more necessary; and it is very well worth while, because of the long Time this will last.

The Land being well broken by Tillage, should be manured with mellow Dung, or some of the richer Kinds in a small Quantity, as Soot, than which nothing is better. This done the Barley is to be sown, and after it is harrowed in the Saintfoin is to be sown by the broad Cast-way. But let the Person who does it have a Caution given him, to scatter the Seed very thin, and sow it twice in a Place. This is the only Way of raising a Crop of Saintfoin according to the common Methods, with any tolerable Degree of Regularity. When sown, the Ground is to be harrowed lightly over, and nothing more is to be done till the Time of rolling the Barley, which is also of great Use to the Saintfoin.

Those who sow Saintfoin with Oats must use the same general Method as with Barley, but the former is always the better.

Saintfoin may be sown alone in Spring; but that is not the best Practice. It may as well be got into the Ground the October before, and by this Means there will be a Crop of it a Year sooner than there would be in the common Way. The Choice of the Seed depends upon the same Particulars as that of Clover, it should be clean, heavy, dry, and of a shining Surface. The freer from Husks the better.

The Difference in Respect of the Quantity of

Seed to be allowed in this, and in the Drill Husbandry, is very considerable: five or six Bushels are commonly allowed in this Way of the broad Cast sowing, to an Acre, and less than four is not sufficient; the other is rather too much. When Ray Grass is sown with Saintfoin, the general Proportion is five Bushels of Saintfoin Seed, and one Bushel of the Ray Grass to the Acre.

When Saintfoin is sown alone, if the Weather be dry at the Time of its first coming up, 'tis very apt to take a Stint in the Growth, from which it is a long Time recovering; this may be prevented by watering it by Means of a Cart, with a Convenience behind pierced with Holes. In the new Method of Husbandry this would be easy; but it has been practised in the common Way with very good Success.

When Saintfoin is sown in Spring with Barley or Oats, the sooner it is got into the Ground the better; and in general it succeeds much the best when sown alone in Autumn. The dry Weather that is so prejudicial to its Growth is not to be expected at that Season.

In a succeeding Chapter we shall treat of mowing Saintfoin for Hay; but here we are to consider the best Method of feeding of Cattle upon it while on the Ground. This is a very profitable Practice, but it requires some Management. The Cattle are not so apt to hurt themselves with this as with Clover, but they may very easily damage the Crop; and when the Farmer finds that it is one of those Crops calculated for lasting several Years, he will understand that it is worth while to guard against such Accidents.

In order to his understanding how to do this best, he must acquaint himself with the Nature of the Plant. Saintfoin is very strong and hardy, and is not easily injured when it is well established in the Ground; but at first it is very easily; especially at the Top of the Root, where the Damage is not readily recovered.

For this Reason let the prudent Farmer be tender of his Saintfoin the first Year. The most likely Methods of hurting it would be the putting large Cattle into the Ground while the Plant is very young, for its Sweetness will tempt them to eat it down close, and by that Means hurt the Head of the Root; and at the same Time their Feet would increase the Mischief by treading of it down.

Therefore if the Farmer finds it needful to put any of his Cattle into a Saintfoin Ground the first Year, Sheep are the most profitable; but it is best to omit this entirely.

The most beneficial Method of managing Saintfoin is to mow it the first Year, cautioning the Seythemen to be very regular in their Work, and not to come too close to the Root: the next Year Sheep may very well be fed upon it; and after this it will have got so much Strength that it may, without Hazard, be used according to the Farmer's Circumstances and Discretion in feeding and mowing.

We have named twelve Years as a Time during which Saintfoin continues very good and strong; but in this all that is to be done is speaking generally and in round Numbers, for according to the Nature of the Ground, and the Usage the

the Crop has received, it will in some Places be worn out sooner, and in some it will last twice that Time.

When worn out it may be plowed up and sown again, or another Piece of Ground found for that Purpose, and Corn sown on this; but it may also be refreshed by Manures: of these none answers the Purpose so excellently as Marle. A tolerable Quantity of this spread over a decaying Piece of Saintfoin, will refresh it for several Years; and there are Circumstances of Affairs under which this may be very well worth while. Very rotten Dung may be used for the same Purpose, or Soot; but nothing answers so well as Marle.

The feeding upon the Saintfoin Ground is an excellent Thing for Cattle: it is full of a rich Nourishment, and yet not rank. It fattens them, without breeding Disorders. Spring is the Season when it best answers this Purpose, and this is most convenient to the Farmer: the only Caution he need have in this Respect, is not to put heavy Cattle upon it in wet Weather: in any other Season, when the Crop is well established, they will not be able to hurt it; but their Feet in such Weather will do some Damage; and the succeeding Crop of Hay may easily suffer more from this, than from all their feeding.

As the Spring is the best Season for feeding large Cattle upon it, the Autumn and Winter are the most proper for Sheep: this also very well answers the Farmer's Purpose, who contrives accordingly. The great Shoot of the Spring is sufficient for the Cows and Oxen, and the Crop recovers itself sufficiently for one mowing, after which there grows a young Shoot that serves very well for Sheep, at a Time when they want it; and they neither damage it by their close eating, nor by their heavy treading. No Food fattens Sheep so freely or so suddenly at that Season, and none is better for Oxen in Spring, or for Milch Cows, when eaten upon the Ground, or Green in the Rack: it causes Abundance of Milk, and does not give it that strong and particular Flavour it has from the feeding on Clover.

The general Cautions we have given must be enlarged or retrenched, according to the Soil and other Accidents attending the Crop. In a dry Soil and dry Season large Cattle may be turned in upon the growing Crop, earlier than we have said; and on the contrary, in a moist Soil they must be kept out later. Nothing establishes itself more firmly in the Ground than Saintfoin, giving it Time; but when it is trampled upon young, in a damp Ground and wet Season, it is damaged in such a Manner, as often never to recover it thoroughly.



C H A P. XIX.

Of mowing of Saintfoin, and the Uses of its Hay.

WE have now to mention the second Condition of Saintfoin that is in the Form of Hay, and in this it is not at all less

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valuable than in the first. If fresh Saintfoin be excellent for the horned Cattle, the Hay of it is one of the best known Foods for Horses; nor is it confined in its Use to them. There is a particular Management required in keeping the Ground for Hay, but it is so like that used for Clover, and indeed for natural Grass, that the Farmer who is unaccustomed to this excellent Kind will need very few Words to explain it.

In order to have a Crop of Hay of any Species, the Ground must be laid up a proper Time for that Purpose. The Time for laying up Saintfoin for this End is toward the latter Part of MARCH, and from that Time two Months will bring it into a Condition for mowing to great Advantage.

Saintfoin is to be mowed like Clover just when it gets to Flower, with this Difference, that the Saintfoin may be allowed to stand till a little forward in Bloom, but it must not be suffered to remain till the Bloom begins to fade, and the Seeds to be formed. In Clover the greatest Benefit rises from cutting it just when the Heads are all formed for flowering, and but few of them have opened; in Saintfoin the exact Time is when a good Number of the Flowers have opened, but none are fallen.

It is then to be mowed and made into Hay, by frequent and careful turning: it requires more Care and Pains than common Hay, but not so much as Clover, the Leaves and Stalks not being so juicy.

The propagating Saintfoin for the Service of its Hay, is a Thing of the greatest Importance to the Farmers, in many of our Corn Countries, for the Nature of the Land in many Places is throughout very ill adapted to Pasturage; and the Profits from Corn are so great, that very little is used for that Purpose in others. In some Places this is carried to such a Height, that there are large Farms in those Parts of the Kingdom that have some very little, and others no Land of the common Pasture Kind, so that the People who occupy them can scarce keep any Cows in most, and in some find it very difficult and expensive to support their Horses. In this Case the introducing of Saintfoin must be a Thing of great Convenience, it is bringing in a Crop that will be managed with Ease in their own Way, and will grow on the common Run of their Grounds, and will come in the natural Course of their Tillage; and this will feed their Horses and other Cattle, and if they chuse to cultivate more of it will bring them a great Profit at the Market.

A Field of Saintfoin will, in such a Case, make a prodigious Change in the Farmer's Affairs. He may feed Cows, if he have Ground near Home, with the fresh cut Saintfoin during the whole Summer, under Cover in Racks; and in Autumn and Winter he may turn them in to the Aftermath of it, only observing the Cautions we have given him to favour the Ground in wet Weather. When the Winter is advanced he may turn in his Sheep; and then feed the Cows under Cover again, with the Hay cut at the MID-SUMMER mowing, and in Spring turn them into the fresh Growth of it again. This is a prodigious Thing in Counties where natural Grass is scarce;

scarce; the Farmer in these Places used to be confined to the single Article of his Business respecting Tillage, and the Growth of Corn; but by the introducing of this Plant, he is able to undertake the Whole, and share the Advantages of those more happily situated, part of whose Land falls out naturally for Pasturage, part for Corn; and who find it easy to keep up such a Proportion, as makes them mutually subservient to one another.



CHAP. XX.

Of Lucerne, its Soil, and the Manner of sowing it.

LUCERNE, or as the FRENCH call it, La Lucerne, is one of those Plants which we have introduced like the Saintfoin from Abroad, into the Practice of the BRITISH Husbandry.

It is one of those Species which happily serve in the Place of natural Grass, and are therefore called artificial ones. We have said the less of Saintfoin in this Place, because it had been treated of before on another Occasion. Lucerne having not been mentioned yet, we are to consider it here at large.

It is a pretty looking Plant, with blue Flowers. The Root is very long, and of a considerable Thickness. The Stalks are firm, upright, and branched; they have great Numbers of Leaves growing three on each Footstalk; and the Flowers stand in little Heads, followed by a Kind of twisted Pods.

It answers the Purposes of Saintfoin to the Farmer, and, like that, endures in a serviceable Condition many Years.

Lucerne has been long known in Husbandry, and at all Times very famous; we had it from FRANCE; but the ROMANS in antient Time have written greatly of it; and by the Labour and Expence they employed in its Culture, it is plain they were acquainted with its Value. They called it Medica, and we find frequent mention of it in all their Poets, as well as Prose Writers, who treat of Agriculture. They preferred it before all other Plants as a Fodder for their Cattle; and by what Experience shews those who have raised it here, of its Effects, they had Reason: it is certain nothing excels, and perhaps it would not be too much to say, nothing equals it; with this Character, which is vouched by the Experience of all Husbandmen in other Countries, and in no Part contradicted by the Trials that have been made of it in ENGLAND, we hope it will become more known, and in some Time universal.

We have in the last Chapter shewn the great and particular Benefit there is in Saintfoin, and there is the same or more in this. The Antients have left us Things concerning its Effects in fattening of Cattle, hardly to be credited; but the Account the FRENCH, among whom it is more commonly cultivated, give of it, and what I have seen of some raised in ENGLAND, seem to give Reason to believe those Relations are not much exaggerated.

It is sweeter than Clover, or even Saint-

foin; and has so many known Advantages, and so few Objections have been raised against it, that the only Reason why it has not been more generally introduced among us seems to be, that its Culture is not sufficiently understood. In this, however, there is nothing very difficult; and we shall lay down a Method supported by some Experience, which will lead the Husbandman to all its Advantages without any Hazard of its failing.

With Respect of Soil, Lucerne will grow on any. This is a Recommendation of the most important Kind, because it puts it into every Farmer's Power to raise it. Tho' it will live on any, it will thrive best on the richest; but there is none where it will not be of equal Benefit with any other Crop it would afford.

The Antients were so sensible of its Value, that they gave it the best natural Soils they had; they improved these with all possible Care by Manure, and by Tillage: there is no Crop for which we dress the Ground in nearly so laborious, or nearly so expensive a Manner; and it is beyond a Doubt, that if we would follow their Example in taking a great deal of Care of it, and bestowing, if not so much as they did, yet a sufficient Expence and Labour upon it, we should reap proportionable Advantages.

We can perceive that with all their Expence, they had not the right Knowledge of its most advantageous Culture; they always sowed it thick, which, by what we see in Experience, must have had a very bad Effect.

The Root of Lucerne being large, is enabled to support a large Head of numerous Stalks; and this is the Method by which it will be most serviceable to the Farmer. Now this can only be promoted by its standing at a Distance one Plant from another. On this depend the great Profits arising from Lucerne, and this the Antients had not; nor can we have, in the common Method wherein it is propagated here; for all our Farmers that have tried, have run into the same Fault with the Antients: they have all sown it so thick, that the Plants have starved one another; and instead of a Field covered with a due Number of flourishing and vigorous Heads of it, they have continually an innumerable Multitude of small poor ones.

For this Reason it is easy to see, that the Drill and Horseshoeing Method must be fitter for this than for the common Method; because that Way the Plants will stand remote, and they will be vigorous: this will also be farther promoted by the Horseshoeing, in a manner which it can be no Way else. It is to these deep rooted Plants, that Method of Culture is most particularly adapted. They spread at a Depth under the Ground by Means of very large and numerous Fibres; and the deep Plowing between the Rows by this Practice, breaks the Earth about them while growing, which can never be done any Way else.

We know by all Experience, the Benefit of breaking and dividing the Ground while Plants are in it, and by this Means it can be done at Times during all those Years the Lucerne stands upon the Ground; and will always have its Effect.

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The keeping a Crop of Lucerne in this vigorous Condition, is of more Benefit than in any other Case. It is in a Manner particular to this Plant, that as soon as mowed, it sends up new Shoots in Abundance, from the Bosoms of all the Leaves; that is, the Place where they join the Stalks; and from the Part just below, where the Scythe cut off the Top: these are much more quick in Appearance, and more numerous than in any other Field Plant, and they furnish an immediate second Crop.

This, tho' an Accident in Nature, is yet greatly to be promoted or retarded by the Growth of the Plant in a more or less vigorous Manner; and this will depend upon its Distance, and its Manner of Culture. In the common Method of Husbandry it is too close to be well nourished naturally, and there is no Possibility of Arts coming in to its Assistance: in the other Method, the Plants stand clear, and the Hoe Plough supplies them continually with new Stores of Food: therefore in this Way, the shooting of a new Crop will be almost instantaneous. The FRENCH have introduced this Method of Husbandry into their Fields of Lucerne, from the Writings of Mr. TULL, our Countryman; and they boast of its Success. It is a Reproach to us that others have the Advantage of Labour undertaken in vain for our Service.

It is from this sudden and strong shooting from the old Stalks, that the Lucerne yields so many Crops, we see Clover will very indifferently afford them; two is all it can be made to give with full Advantage; and from Saintfoin, the best Practice is to take but one a Year. On the contrary, the Lucerne yields at this Time seven Crops a Year in the South of FRANCE, and all large ones; and in other Places where it is cultivated, five or six according to the Advantage or Disadvantage of Season or Situation: in ENGLAND we may, by the Horsehoeing Husbandry, render it capable of producing more than will be easily credited by those who have not Experience of the Nature of this Plant, and the Effect of that Cultivation.

It is no wonder that in ENGLAND this Plant has not hitherto succeeded to the full Effect whereof it is capable; because the very Advantages of our Soil and Climate, when proper Care is not taken, otherwise make against it.

Wherever Lucerne is planted, the greatest Danger that can attend it, is the Growth of common Grass amongst it. The Lucerne always declines as this advances; and by that Time it comes to spread and turf, the Crop will be good for nothing.

There is no Country where Grass is more universal, or where it turfs sooner than in ENGLAND; therefore no Place where a Crop of Lucerne would be likely to be so soon over-run and destroyed; but then by the Drill and Horsehoeing Husbandry, it is very easy to prevent this Accident; and then that Moisture of the Ground, and mild Temperature of the Air, which would encourage the Grass, will also very happily forward the Growth of the Crop.

The good Crops of Lucerne in FRANCE and ITALY, are, in a great Measure, owing to the Sun drying up the natural Grass: when there

happen any considerable Rains there in Summer, the Crop is poor; with us therefore there never could be expected a good one, if we could not prevent this Accident, but it is plain by the Horsehoeing Husbandry we may. In the Endeavours that have been hitherto made to raise it, People knowing the Danger to which it was liable from the Growth of the Grass, have sowed it thick, that it might starve the Grass that should attempt to rise among it. The Antients followed the same Practice, and gave the same Reason for it: with them the Error was not of so bad Consequence, because they prepared their Land so richly; but with us it is always destructive, for it starves itself when sown thus thick; and being starved, the Grass grows more easily among it.

We have seen many Trials made in this Manner, and all unsuccessfully: the natural Grass has grown up among the Crop, and continually gathered Strength; and the other has proportionably declined; till in a very few Seasons a Pasture of Lucerne has been changed into one of common Grass, with only just as much of the Lucerne as would serve to shew it once grew there. As the Lucerne draws its Nourishment deep, the upper Part of the Ground will always support Grass; and in ENGLAND, wherever Grass can be supported, it will grow; and wherever it grows among Lucerne, it destroys the Crop. Nothing but the breaking up the Ground about it, while growing, can prevent this Accident; and no Method of Culture, but that by the Drill and Horsehoe, admit this: it is very plain to Reason therefore, not only that this Method will suit Lucerne better than any other, but that it never can be raised advantageously in ENGLAND any Way else.

In FRANCE and ITALY they plow between the Rows, where it is less needful: there is double Reason why we should do it here. In those Countries it serves but one Purpose, which is breaking and dividing the Ground to supply the Plants with Nourishment; but with us it will answer two, and those equally important; the giving Nourishment to the Plants, and destroying the Grass.

The Seasons in ENGLAND, when this Crop is properly managed, favour it even under the same Condition in which they hurt it in those Countries where it is most propagated: our hottest and driest Summers will never damage it, when cultivated by the Horsehoeing Husbandry; for the Wet will supply it with Nourishment, which the Earth broken by the Hoe, will be ready to detain for its Service; and the Heat of our warmest Weather will only be serviceable to it; and it will find Food in the driest, when the Ground is open, as it is thus made to the Reception of the Dew.

As to the Cold of our Winters, that is not to be feared; because Experience shews us, that Lucerne will live and thrive where many of the Garden Plants, that stand the Winter with us, perish: so that if it can bear a colder Winter than our own, it will be safe from Injuries in ours; and from this, and all other Considerations taken separately first, and afterwards together, there is Reason to believe that ENGLAND

is a Country where this Plant may be raised as advantageously, as in any upon the Earth: there only requires a proper Method of Culture, and that Method is the Horsehoeing Husbandry, which has been long practised elsewhere; and which Mr. TULL, from the Success he saw attend it in other Countries, brought into ENGLAND.



C H A P. XXI.

Of the best proper Soils for Lucerne.

LUCERNE we have observed, will grow on a poor or rich Land: the ROMANS of old gave it the richest Soils they had, and improved them most; and at present we see it grow very well in FRANCE upon some very poor ones, with no great Expence of Culture, but under the Advantage of the Horsehoe: what there is in the Ground most favourable to it is Warmth, and a due Depth; what is most injurious is a bad Bottom: it is easy to conceive, that a Plant which roots so deep, is affected by what lies below the Surface; and this has been the Reason why it has failed in some Parts of ENGLAND, where its great Destroyer, the Grass, has not been very troublesome. I have seen tolerable Care used about it, and yet it has not thrived; and, upon examining, have found under the Soil a Bed of tough Clay: this is an Under-stratum very disadvantageous to many Growths, but to none so much as to Lucerne; for it detains Water about the Roots, and at the same Time chills it; so that many of the Plants die, and the rest dwindle away.

A severe Winter will destroy a Field of Lucerne which has this Disadvantage, while one that is not under this Check, shall not lose a Plant.

As Lucerne is a Native of a warmer Climate than ours, we should give it our warmest Soils. A very good Loam, with a large Portion of Sand, and of mellow Earth among it, and with very little Clay, is the most favourable Soil of all for us: next to this may be accounted that dry crumbly Earth we have in many Parts of BUCKINGHAMSHIRE, which is a Composition of mellow Earth and Sand; after this a warm, and not over-barren Gravel is to be preferred; and, lastly, any sandy Soil that has some Degree of Richness; for it will not prosper in absolute Sand.

Of all these Soils the gravelly is found to succeed best, in the particular Effect of ripening the Seed of Lucerne; and, in general, such Places as are too moist from frequent little Springs are worst, though their Soil be ever so favourable.

This is an Article in which we see a great deal of Difference with Respect of Climate, too much Water is destructive of this Plant in ENGLAND; whereas in FRANCE and ITALY, it never succeeds so well as when near the Banks of Rivers and Springs; but there the Heats are greater, and it therefore requires more of that Refreshment. Though we do not recommend

that tedious and expensive Method of Culture, which was given to Lucerne of old; yet we shall advise the Farmer who intends to plant it on a poor Soil, to enrich it according to its Nature, with any of the Manures most agreeable to its Kind. Of these we have treated in their proper Place. He should thus prepare the Ground for the Plants; and when they are on it, he may, if he please, occasionally refresh them with a little more.

This Doctrine is not agreeable to the System of those who would have the Use of the Hoe Plow supersede that of Dung. We have said already, that no Method of Culture answers so well as this for Lucerne, nor indeed can it be raised beneficially by any other Method in ENGLAND; but we advise the assisting this Practice with Manures for the Sake of frequent Crops, these depending upon the quick Growth of the Shoot after Mowing.



C H A P. XXII.

Of the sowing of Lucerne, and managing it in the Ground.

THE Antients, after their great Preparation of the Land, sowed their Lucerne in the Beginning of APRIL; at present they have two Seasons for it, both in ITALY and FRANCE; the first is in MARCH, the latter in OCTOBER. The ROMANS erred in sowing it so very late in the Spring, because there wanted Rains, and they were obliged to water it: the present Practice in those Countries is better; and, in general, the OCTOBER sowing is the most profitable; the Plants having Time to root themselves well in the Winter, and the wet Season assisting them greatly in their first Shoots.

The Difference of Climates is so great, that it would be very prejudicial to attempt introducing the Methods of Husbandry from ITALY into ENGLAND in the same Form: it is very proper for our Farmers to know them, that they may perceive on what their Success depends; but they must be here accommodated to the Climate. If we sow Lucerne in Autumn, it will lie in some Danger from the Winter. However, the Farmer knowing this, may, if he pleases, stand the Hazard. Young Lucerne will be destroyed by those Winters which will not affect it in a more established Growth; and in the same Manner afterwards, a Field of it that is ill managed, and poor, may be hurt, when one that is in better Condition escapes. As to the OCTOBER sowing, the Chance is this; if the Winter be severe, and the Soil unfavourable, the Crop may be lost; if it should prove mild, and the Soil agreeable, the Lucerne will stand; and it will have got such Strength, that it will make much better Head early in the succeeding Summer.

As we shall not lead the Farmer into Hazards, in the Culture of a Plant we want to introduce more generally into this Country, we shall advise him not to think of the OCTOBER sowing, but to limit himself entirely to the Spring,

Spring, and to wait till very late in that Season, that the Danger of the Frosts may be over.

We have blamed the Husbandmen of ITALY, for deferring their Spring Sowing of Lucerne till APRIL; but we shall recommend that very Practice to the ENGLISH, and advise the deferring it here till toward the Middle of that Month.

The sowing it earlier, may, in some Years, succeed better; but this depends upon the Accidents of the Season, and we would not have the Farmer liable too much to them in a new Undertaking. If it should be sown in MARCH, and a mild dry Time follow, it would be better than later; but of this no-body can be sure: and, in other Cases, the Expectation of a Crop are easily destroyed two Ways; for if a great deal of Wet should come soon after Sowing, it will rot the Seeds in the Ground; and if Frosts of any Power follow the Time of its coming up, they will utterly destroy the Crop.

The Quantity of Seed to be allowed to an Acre, is a Thing to be determined by Experience; but the Way of sowing it by the broad Cast, which has been the Custom in most Parts of ENGLAND where this Plant has been tried, is by no Means proper on any Account; and a vastly larger Quantity of Seed than needful has always been allowed. The Method we propose by the Drill, will easily determine the needful Quantity of the Seed. The Plants should stand at about seven Inches Distance in Rows, and these Rows should be at a Yard distant one from another. It will be possible to work the Horsehoe in these, and the Plants will be perfectly well supplied with Nourishment. The Farmer need not be afraid of having by this Method, a sufficient Quantity of Plants upon the Ground; for each of these, if rightly managed, will, when grown to Perfection, have from a Hundred to more than two Hundred Stalks.

When the Lucerne is sowed thin in Drills at a Yard Distance, in the Middle of APRIL, upon a proper Soil well broke for that Purpose, the Moisture and Warmth of the Season will soon bring it up. As soon as it has got a little Height, the Farmer is to send in some Hand Hoers, with Instructions how to work. They are to hoe up the young Growth of Weeds that have risen about the Rows on each Side, and to thin the Plants where they have come up too thick, leaving the most promising at the Rate of about four in every two Foot. They are not to thin these to exactly six Inches Distance each, but to preserve the best Plants in about that Number. These Hand Hoers are not to meddle with the Middle of the Intervals, but only to destroy the Weeds, and break the Surface of the Ground just about the Rows.

This done, the Plants are to be left to themselves till they are of some Stature, and the Intervals are over-run with Weeds. Then the Hoe Plow is to be sent in, and a tolerably deep Furrow is to be turned in the Centre of each Interval.

This is to be repeated as often as the Weeds appear, only leaving here and there an Interval free and unplowed for the Convenience of making the Hay.

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The Intervals that are left at one Time may be plowed up at another; but in that Case there must be a Number made smooth by Rolling at proper Distances.

By this Management Lucerne will thrive very well till Grass begins to grow among it, which it is always apt to do, and always as we have seen to the Destruction of the Crop.

In this Case there must be a good Furrow plowed from each Side of every Row; and afterwards there must be Harrows brought in to the Ground, and drawn crosswise; these, without injuring the Crop, will tear away the Grass which the Plow raised, and such as grow among the Plants; after this, the two Furrows first plowed up, beside each Row, are to be turned again upon them; and there will be the double Advantage of clearing away the Grass, and giving the Roots of the Crop a fine Quantity of fresh Earth for their Nourishment.

The Grass that was left upon the Ground, and half killed by the Sun, will be thus buried and thoroughly destroyed; and after this it will not be able to make any Head again for a great while.

As to the thinning of Plants in the Rows by the Hand Hoe, it must not be done till they have got some Strength, for fear of Accidents. The Sweetness of the Lucerne Leaf, when very young, makes it liable to the same Damage by the Fly as Turnips, therefore it is proper to see that Danger over before it is thinned; for when the Plants have got some Strength, this Insect never attempts them.

As to the Horsehoeing afterwards, it is to be repeated oftener than to any other Species whatsoever, for this plain Reason, that it is to forward so great a Number of Crops. Those who have hitherto raised Lucerne in ENGLAND, following the common Method of Husbandry, have contented themselves with two Crops a Year: but we see what it yields in other Countries, and by the same Management we may bring it nearly, if not altogether to, the same Richness here.

If the Farmer should at any Time have neglected his Lucerne, so as that the natural Grass should become a Turf, and the Plants appear, as in that Case they certainly will, in a decaying State; the four coultered Plow is then the Instrument for his Purpose.

This we have described in its Place, and shewn in what Manner it breaks and tears a Turf to Pieces, be it ever so tough and thick: with this he is to go round every Row, turning the Furrows toward one Row, and from the next, the first Time; and the next, from the Rows they were turned toward before, and to the others: thus taking Care not to hurt the Plants by letting the Furrows lie too long upon them, the Grass will be destroyed, and the Plants will recover.

In this Case there must be some Intervals left as in the common Course for the making of the Hay; and by this Practice there will be found no Difficulty of making this most valuable Plant succeed perfectly well in ENGLAND, and afford its numerous Crops as in other Countries.

C H A P. XXIII.

Of the Value of Lucerne, and Manner of using it.

THE Superiority Lucerne has over all other of the artificial Grasses, is in the Frequency of its Crop; this gives it a Value to the Farmer which none of the others have; and it is encreased by its natural Richness, and wholesome Qualities.

The others are to be used partly by cutting, and giving them green in the Racks, partly by drying into Hay, and partly by feeding on the Ground; Lucerne would equally answer all these Purposes, but it is better to spare the last, for the Feet of large Cattle would tread it down in such a Manner, that the Owner would lose much more in his succeeding Crops, than would equal the Advantage of that Feeding. In the other two Methods it answers excellently, and a Part of it may be given fresh cut and green all the Summer, while the rest is making for the Winter Service, or for Sale.

The best Season for giving it first to Cattle green, is in the Spring, because its natural Effect is purging first, and afterwards fattening them; but in this, as in Clover, there is some Danger of its making them swell at first, if given injudiciously: to prevent this Accident the Farmer will remember what we have said of Clover, and use the same Precautions, giving them Straw among it first, or beginning by a little at a Time.

In this Way of giving it is safe for all Cattle, and agrees with all; nothing strengthens or fattens a Horse like it, and no Food whatsoever makes Cows yield so great a Quantity of rich Milk, or so little alters it in Flavour.

The great Danger of Cattle's hurting themselves by it, will be avoided by their not being turned into the Fields, to eat at their own Pleasure: this is always to be given them in Racks, and therefore the Owner may always proportion the Quantity at his Discretion.

In this Manner of using, a Field of Lucerne will continue in Heart many Years, nay there is no saying when it will be worn out.

The making it into Hay is the next Consideration, and is of the greatest Consequence. The Profit is vastly great, and therefore it is worth the Farmer's while to be strict in observing all the Particulars relating to it.

The principal are two, that it may be cut young, and that it may be well dried; as to the first it is prodigiously to his Advantage in every Respect, for the Hay will be sweeter, and the next Crop will come much sooner than if more Time were lost, and the Roots exhausted, as we have shewn they always are, when the Plants have stood to flower some time.

The Time to cut Saintfoin is when in full Flower; the Time to cut Clover is when beginning to get into Flower; but the exact and proper Time for cutting Lucerne is when it is preparing to flower, but has none fully open.

The Flowers of this Plant stand in Heads, in the same Manner as those of Clover, but the Plant must be watched carefully for their Appearance. When they have formed themselves is the Time of cutting the Crop; and in that Case, the Roots being full of Vigour, there will be a Shoot of four or five Inches high toward a new Crop, while the Hay is making.

There is no appointing the certain or exact Times of mowing the several Crops of this Plant, but it will be easily found by Observation; the first must be cut as soon as the Plants are in this Condition; and the others as they successively get into the same State again after every mowing. This has all the Advantage possible. The Stalks of this Plant grow stubby and hard, when it stands too long; but they are by this Means cut while it is very tender; the Cattle are fondest of it when it is cut in this Condition; it leaves the Roots the strongest, and the next Crop in Consequence follows quickest; and being cut in the same Manner, when just getting toward Flowering, serves in the same Way the Farmer's Purposes best, and makes Preparation for the next in Succession. Thus the Field of Lucerne, properly managed, yields from time to time, during the whole Summer, successive Crops, and all very large ones, of an excellent Hay; and with Respect to the Horsehoeing, the oftener that is repeated the quicker the Crops will follow one another, and the more plentiful they will be.

While the Lucerne is in this proper Condition for cutting, the Stalks are single, upright, and of a pale Green: after this, when the Flowers begin to open, they become branched and grow yellow, and then they soon will be sticky, tasteless, and unprofitable. Therefore the Farmer's Interest is every Way concerned to seize upon the proper Time.

When it is cut the Mowers must have one general Caution, to keep their Scythes very sharp, and to go on evenly and regularly throughout the Ground, for on the Smoothness of the Top depends, in a great Measure, the quick and numerous Springing of the Shoots for a succeeding Crop.

When mown it is to be spread upon those Intervals left plain, or rolled smooth for that Purpose, and very carefully turned and dried. It requires a more careful Management in this Respect than either Clover or Saintfoin, for it is more apt to damage afterwards. It is in this Respect very apt to deceive the Farmer, for it will seem dry when it is not thoroughly so, and in this Case will be very apt to get damage afterwards, and so spoil the Hay of other Crops that happen to lie near it.

As to the Seed, that is usually imported from FRANCE, but it is possible to bring it to Ripeness here; for this Purpose a warm dry Gravel, well exposed, is to be chose, as we have named before; and the Plants are to be thinned to a greater Distance. They will thus rise into large and very numerous Stalks, and these must not be cut down at all, but left to follow the Course of Nature: their Flowers will thus appear in great Abundance, and after them the Pods, in which, if the Season be favourable, the Seeds will ripen

to all the Perfection of such as are brought from Abroad.

CHAP. XXIV.

Of Hop Trefoil.

WE have before spoken of the Uncertainty there is in the Husbandmens expressing themselves, concerning the Plants they cultivate. And this is another Instance: many of them call this Plant Trefoil, and others three leaved Grass, and then speak of its Culture or Uses without any farther Distinction. This is the Case with the Writers on Husbandry, as well as those who practise it, and in them it is by much the most unpardonable. When they propose to inform the Ignorant in the Uses and the Management of a Plant, from which a profitable Crop may be raised, 'tis very fit they should first inform them what the Plant is: this they think they have done when they have called it Trefoil, or three leaved Grass, not knowing, or not considering, that these are the Names of no particular Kind, but of all those Plants which bear three Leaves on a Stalk. Trefoil is the Name of Clover, and of all the other Plants of this three leaved Kind, therefore there requires more Distinction. The Plant cultivated under the Name of Trefoil in certain Counties of ENGLAND, may be very well known under that Name, improper as it is, in those Places; but the Inhabitants there do not want the Information: he who writes does it, or should do it, for the Service of all Persons: those to whom he can be most useful upon that Head, are such as live in Counties where the Plant he treats of is not cultivated, and who, by this Means, may bring it into Use there. These can never get any Information what the Plant is by such a Name, and it is needful to distinguish it by one more particular, and to establish that Name by a Description. This is the Course we have followed in the present Work, and shall continue in every Instance.

There are a great many Kinds of Trefoil, or Plants which have the Leaves always three on a Stalk, or three at a Joint, and these are all called by the Name Trefoil, but with the Addition of some Word, by which the Kind is distinguished; one of these is the Trefoil, simply so called by the Farmers, and raised like the other artificial Grasses for feeding their Cattle; the particular Distinction of this is, that the Flowers grow in small Heads, resembling a Hop in Shape, and from this it has been called Hop Trefoil, or Hop Clover, and in Latin *Trifolium Lupulinum*, which means the same. But as there are more Kinds than one of this Hop Trefoil, the largest is that chosen for Culture. Under this Name the Plant will be found treated of by all who have written on Herbs, and the Farmer knowing it by this Name, will always be able to inform himself and others about it.

This, though the largest of the Hop Trefoils, is but a small Plant in Comparison of most of the former, but it grows thick, and makes Amends for the Want of Height, by the Number and Quantity of its Stalks.

The Root is whitish, slender, and hung with Fibres; the Leaves stand three together, and are small, oval, of a pale Green, and very numerous; the Stalks are eight or ten Inches high naturally, but they may be made taller by careful Management; the Flowers are small and yellow, and they stand in oval Tufts or Buttons, which in a certain State much resemble Hops: the Seeds follow, and are contained in dark coloured Husks, and stand in a Head or Cluster of the same Form.

This is the Hop Trefoil cultivated by the Farmer. It is a Native ENGLISH Plant, and therefore stands excellently all Weathers, and all Seasons: for the same Reason it sows its Seeds, and continues itself upon the Ground better than any of the foreign Kinds, and is up earlier in the Spring; this gives it a very considerable Value with the Farmer. The Plant that is sure to be up early, that is too hardy to be hurt, and that gives a good, sweet, and wholesome Food to his Cattle, when he can scarce get it any where else, must needs be very valuable.

This was one of the first Improvements made by the ENGLISH Farmers, in the Way of the artificial Grasses; but since the Introduction of the others it has been less regarded, though on many Accounts it is very valuable, and ought always to be in his Remembrance, as one of the many Crops by which he may vary his Course to the Ease of his Land, and his own great Advantage.

The Soil that suits the Hop Trefoil best, is a soft mellow Earth; next to this it prospers in a light rich Loam: it will grow on almost any Ground, but best on these; and worst of all on such as are clayey or wetish. The Farmer who has a dry Piece of Ground, and has a Mind to a Crop of Hop Trefoil, need not scruple sowing it let the other Condition of the Ground be what it will: he will have a better or a worse Crop according as the Soil more or less suits the Plant, but he will never fail of having enough to answer his common Purposes. Hop Trefoil may be sown alone or with Corn, in the same Manner as Clover, and in either Case will succeed very well; it has also a third Use, which is, the propagating it in common Pastures. This is done by sprinkling the Seed among the Grass, where it freely comes up along with it, and greatly thickens it and improves its Quality.

When Hop Trefoil is sown in the Field, whether alone or with Corn, it may be sown either in the Husk or naked; this is a Circumstance to which the Farmer must attend with Care, otherwise he may be led into great Errors; the Quantity proportioned to an Acre differing very greatly, as the Seed is clean or with its Husks. Different Soils may make some Variations needful, in Respect of this as of all other Seeds; this is a Subject we have considered before, and as it holds good in all Crops need not be repeated; but for a general Rule we shall tell the Husbandman, that if he sow the Seed naked and clean, he is to allow twelve Pound Weight of it to an Acre; and if in the Husks he is to measure it, and allow to the same Quantity of Ground two Bushels.

He will by this Distinction have some general Guess

Guess also, at the Meaning of those practical Writers, who are less nice in their Explanation than Practice requires; when he reads of Trefoil Seed by Weight, he will know it is meant of the clean Seed; when by Measure, of that in the Husk.

Knowing the Soil and Quantity of Seed, the next Thing is the Manner of sowing. As this is a Plant never expected to grow large, we shall not recommend the new Method of Husbandry for it, but advise the Farmer to sow it at Random, in the broad Cast-way; and for many Reasons shall prefer the Seed in its Husks, rather than naked. This defends it from Injuries by Insects, and from Damage by wet till it shoots, it makes it spread easier from the Hand, the Quantity being larger, and it shoots the quicker for it. This was the Intent of Nature, for the Seed falls to the Ground Husk and all; and we should be wiser than we are, if we took Pains to follow her Instruction and Example in more Instances.

The Farmer thus sowing two Bushels of the Seed, Husk and all, by the broad Cast-way, will have a thick promiscuous Crop early up; and it will, while it stands, be continually thickening itself more by the shedding of its own Seed, which never fails to grow in Abundance; it will do this even when eaten upon the Ground, the Flowers being very numerous, and ripening in such a Succession, that there are always some Heads ready to shed their ripe Seed, let the Condition be what it will; but if it be let to stand for Hay there will be Millions of new Plants.

There are two Seasons for sowing this Trefoil, Autumn and Spring, in either of which it may be sown according to the Farmer's Discretion, either alone or with his Winter or Summer Corn; but when the Choice is equal in other Respects, he may be sure it will always succeed best sown alone.

The Earth requires no great Preparation for this Crop, for the Plant being wild will grow any Way; the only Information that need be given the Farmer on this Head is, that the Seed will not grow if it be buried too deep. This will serve him to a double Purpose, first in instructing him to sow it in such a Manner, that it may be lightly covered; and afterwards to bury it by deep plowing, when he intends another Crop; for without this Care it will rise among the Corn when not intended, and often be very prejudicial to it.

For sowing Hop Trefoil the Farmer should chuse a calm Day, especially as we have advised the sowing the Seed in the Husk; for in this Case, being large and light, the Wind would take Effect upon it, and scatter it very unequally, however steady and careful the Hand were that sowed it.

When it is on the Ground the best Method is to draw a Roller over it, and then to harrow it very lightly. This is more Trouble than many take, but it is not much, and the Advantage in the Crop will very well answer it. The Rolling alone would be sufficient, but that if a Shower comes it loosens the Seeds, and if a windy Day follows, it scatters it all at Random. In the Harrowing great Care must be taken to do it

extremely light, otherwise the Seed will be too deep buried.

The Crop thus sown will rise quick, and increase in Value every Year. It requires no Trouble; but may be fed or mowed at Pleasure, and the best Management is to do both at the proper Times. It is hardier than any of the others, and less liable to any Kind of Damage: Cattle are very fond of it when cut and given them fresh in Racks, but they may be turned into the Field almost at any Time without Hurt. Of all the Plants of this Kind none is so wholesome as the Hop Trefoil: some have found this so frequently by Experience, that they always sow a Proportion of it among Clover, to prevent the Effect of that Plant, in swelling and disordering the Cattle that eat it. They grow very well together; and the right Proportion is five Parts of Clover Seed, and one of clean Hop Trefoil.

The early Appearance of this Trefoil is of great Service to the Ewes and Lambs in Spring, and also to Cows and Oxen: it is therefore a Crop the Farmer should never be without, in larger or smaller Quantity.

The greatest Inconvenience attending it, is what we have named already, that he often finds a Difficulty to clear the Ground of it when intended for something else; but we have given the Method of doing this effectually: it is only to bury it by a deep Plowing, for neither the Seed nor Root will grow when they are covered to any Depth.

C H A P. XXV.

Of Ray Grass.

WE have seen the Farmer calling many of those Plants which he sows for answering the Purposes of Grass; by that Name, though of very different Kinds; but this Ray Grass is properly a Grass only of a particular and valuable Kind. Its Use is the same with that of the several Kinds last mentioned, the sowing for an early Food for Sheep and other Cattle, and none answers the Purpose better. It is hardier than any, and having the Appearance, and with it the Nature of the better Sort of the common Grasses, it is the most easily propagated of any. It is hardier than the Hop Trefoil, and comes in even earlier than that to the Farmer's Service.

We have observed, speaking of Pastures, that there are a great many different Species or Kinds of natural Grass, differing in greater or lesser Particulars among one another. Ray Grass is one of them, its proper Name is Darnel, in Latin Lolium. There are two Kinds of it, the white and the red, so called from the Colour of the Joints of the Stalks, which in the one are white; and in the other reddish: this is the Distinction as to Colour, but they differ in Size and Qualities. The white is the larger, and the red is the hardier of the two. They are both wild Kinds; but it is a great Advantage to the Farmer to sow them, the red or smaller Darnel is the best Kind, because it is earlier and hardier than the other,

other: and sends up more numerous Leaves. The Farmers who do not understand Names much, and they have in this Article, for want of such Knowledge, let in some Confusion. We have observed the proper Name of this Grass is Darnel. It is called Ray Grass, and this some write Raye Grass, and others, according to their Notions of spelling, Rey Grass. This Rey has been spoken as if it were Rye, and thence others have written it Rye Grass; now Rye Grass is an ENGLISH Name of another Grass, one of the worst and most unserviceable of all the Kinds; it grows by Way Sides, and has a bearded Ear resembling that of Barley: this, instead of being cultivated for Use, should be rooted up as a Weed wherever it comes: yet this seems to be directed to be sown and cultivated, by those who write the Word Ray Grass in that Manner.

The Grass properly called Ray Grass, and meant in this Place, is of a middle Stature among the Grass Kinds, growing to a Foot and half high. The Root is a Tuft of thick and very many whitish Fibres: the Leaves are very numerous, and of a fresh Green, they are narrow and sharp pointed, like those of common Meadow Grass, but shorter.

The Stalks are very numerous, and rise among the Leaves; they are round, green, firm, and toward the Bottom very much jointed. The Top of each Stalk is covered with a Kind of Ear. This is long and thin, and is composed of several little Clusters of Husks, representing so many little Ears going to make up the great one. In these are contained the Seeds, which are not unlike the Grains of some of the Corn Kind in Shape, but smaller.

This is the Description of Ray Grass in its natural wild Way of growing, and in which it is common about Foot Paths and in Pastures, naturally growing in a scattered Way in many Places. It does not shew much Difference by Means of Culture. The Leaves are more numerous when it has a good Soil, and the Stalks, if permitted to rise to their Height, will be much taller; but this is not the Farmer's Interest, for as they grow large they grow hard, and are less useful.

Ray Grass may be sown either alone or mixed with Clover, or other of the artificial Grasses, as we have shewn in treating of them; and this is the best Way of managing it.

Any Soil will suit Ray Grass, and this is a great Advantage. We have been obliged to caution the Farmer, against sowing several of the last-mentioned Plants upon clayey or wet Soils; because they will not succeed thereon; but this is a Grass for Land that will support no other. Ray Grass will grow to Advantage on cold, wet, spewy, and sower Land, and is therefore a very great Improvement.

There are Crops intended for the Food of Cattle, which are destroyed by a very dry Summer, or at best rendered of little Use or Value; but this is not the Case with Ray Grass, no Drought of Summer, and no Frost or Wet of Winter hurts it: the Farmer therefore should always have some Land sown with it, because it will stand him in stead when all the rest fail.

Numb. XXXVII.

It is one of the best Winter Foods for large Cattle, and one of the earliest Spring Foods for the smaller, and at the same time there is none more wholesome: it not only is excellent itself, but, as we have before shewn, it serves to correct the bad Qualities of the others.

Ray Grass feeds Horses in a very hearty Manner, and is of so dry a Nature that it will prevent the Rot of Sheep.

No Field will bear so large a Stock as one of Ray Grass, because nothing can hurt it; nor is there any Harm, but rather Advantage in eating it very close, because the worst Damage that can attend it, is the growing too high. The Stalks are as tender and full of Nourishment as the Leaves when young, and they grow up immediately after biting.

When the Farmer sows Ray Grass with his Clover, for the Sake of correcting the bad Quality of that Grass, a small Proportion of Ray Grass, such as we have named on that Head is sufficient; but when he intends to have the full Advantage of the Crop in feeding his early Cattle, he should much enlarge the Quantity. Three Bushels of Ray Grass Seed is a very proper Quantity for an Acre, in a Mixture with Clover, or more may be allowed. In general, after these Hints, the Husbandman will be able to proportion the Quantity to the intended Service; and as the common Custom is to sow a great deal of Clover, with a little Ray Grass among it, he will often find it prudent, where he is to depend upon a Pasture for a considerable Time, to sow it with a great deal of Ray Seed, and a little Clover.

It is the Effect of Ray Grass to make the Clover last a great many Years longer than it naturally would, in whatever Proportion it be mixed with it; but if the Farmer chuse to allow it a large Share, the Pasture will be good as long as he pleases. The Ray Grass, Hop Trefoil, and Clover, will grow excellently together, where the Soil is tolerably dry; and in that Case there is no Way of making a richer Pasture, than by sowing a large Proportion of the Ray Grass, with an equal Mixture of the other two, in about an eighth Part Proportion of each to the Ray Seed.

Beside the excellent Quality of Ray Grass, in growing on clayey and other bad Soils, it will in a very powerful Manner, destroy the worst Weeds that grow naturally in the others. It is observed that where Ray Grass is the principal Growth, there are few Thistles; and if those are but once tolerably got up, they never rise again; the Reason is plain, and the Fact of great Importance. The Ray Grass covers the Ground with so thick a Turf, and draws so large a Quantity of Nourishment, for the Supply, after its constant Cropping, that no Seeds can get in, and if they do the young Plants that rise from them are soon starved. The keeping one of these Grounds free from this Annoyance, is a very considerable Article.

The mowing Ray Grass is an Article that requires a great deal of Circumspection and Consideration, it makes a very good Kind of Hay, and its Seed falling from it, in that Condition, is of some Value; but here the two Points of

Profit interfere with one another, for if the Grass be cut young the Seed will not have its full Size or Hardness; and if it be let to stand for that Purpose the Hay will be harsh, from the Dryness, Coarseness, and Hardness of the Stalk.

In this the Farmer who would act most judiciously, should take a middle Course, cutting down the Ray Grass, not while the Seeds are too young to be useful, nor letting it stand till they are ripe, and the Stalk hard, but coming in when the Seeds are beginning to ripen, and the Stalk is yet tender, thus he will make good Hay, and have tolerable Seed, some of which, if not all, will be sure to grow.

If he particularly want the Seed for sowing some other Piece of Ground, he must let the Crops stand somewhat longer before mowing, and for the Sake of good Seed be content to spoil his Hay, in some Degree; on the other hand, if he have no Regard to the Seed at all, he should cut the Ray Grass just when the Ears are beginning to form themselves upon the Stalk, he will thus have an excellent Hay, and the Roots being unexhausted by Ears, will send up a fresh Shoot in a surprisingly speedy Manner, for feeding on the Ground, or for a second Crop.

The Seed is not an Article of very little Consideration, for it brings some Price; and when the Crop is suffered to stand for it, four Quarters will sometimes be got from an Acre; this at about Two and Nine-pence a Bushel, which may be called a moderate Price, is worth some Loss upon the Article of Hay. Some who think of the Hay as the principal Crop only, gather such Seeds as are found at the Bottom where it is put up; but in this Case, where a Profit is depended upon from the Seed, it should be thrashed for it in the same Manner as Corn: and the Hay, far from getting any Injury by this Management, will be the better.

At any Time if the Crop of Ray Grass be thin, it may be thickened by sowing some more of the Seed; if this be scattered at Random among the Grass, it will take, and encrease the Quantity according to the Proportion used, which may be a Bushel or two for each Acre. The best Season for doing this is Spring, but it may be done in OCTOBER.

This Grass has many a Time saved the Farmer's Stock of Sheep and Lambs, very early in the Spring, from starving; and at all Times it is an excellent Preparatory for the richer artificial Grasses which rise, in Point of Time, after it.

Some have supposed what is called Long Grass in some Parts of WILTSHIRE, to be the same with Ray Grass, but it is a great Error, that is a Kind of Water Grass, with very long Stalks, which will grow but in few Places: it is very useful where it will take, but it requires a rich Soil, and a proper Degree of Moisture, so that it is in vain to think of making it universal. This Kind ripens its Seed but poorly, which is the Condition of many other Plants that creep abundantly at the Root, Nature having given that as the Means of their Propagation, and therefore less regarding the other. When the Farmer shall happen to have a rich wetish Piece of Meadow Ground, he

may at any Time try this Species in it. 'Tis always to be found about shallow Waters, and may be known by the Length of its Shoots, which trail along the Sides, or float upon the Surface. These being stuck into a damp Ground, already covered with other Grass, may take their Chance: if they meet with a Soil, and all Accidents proper for them, they will thrive and be very useful, if not there is no Harm done by the Tryal. It is worth making in this Way, because attended with little Expence or Trouble; if it do not succeed 'tis vain for the Husbandman to attempt raising it by Seed, for of that little comes to such a Ripeness on the best nourished Plants as to grow; and if it were ever so vigorous, without the Particularity of just a right Soil, it will come to nothing.

The Place where this Grass was first observed by the Farmers, was a Piece of Meadow Ground near MADDINGTON, a few Miles from SALISBURY; and the Effect of it being seen in that Place, they endeavoured, but without Success, to propagate it in some others. The Stalks in this Meadow grow to the Length of eight or nine Yards, rooting at every Joint, of which there would be twenty or more in such a Length, and it proved an excellent Food for Sheep. The same Grass has been observed in other Places, and always remarked for its great Length: Sheep in particular are fond of it; and they will eat it greedily as it grows about Waters, as well as when it mixes among the other Grass of Meadows.

With Respect to the other Species of common Grass, numerous as they are, none thinks of cultivating one more than another. In general, those which most resemble the common Meadow Grass are best, and such as are rushy, or have triangular Leaves with sharp Edges, are the worst; these are principally Natives of sower Land, and watery Places. As to the Ray Grass, when it grows natural among other Pasture Grasses, it is always an Advantage, and we have shewn how it is to be raised to great Service by proper Culture.

CHAP. XXVI.

Of Spurrey.

THIS is a Plant very little known among our Husbandmen of the present Time, and not to be ranked with many of the preceding in its Utility; however, as it was once sown in our Fields, and is at this Time propagated in FLANDERS, and some of the Neighbouring Kingdoms; and as it is not without its Use, we have thought it not unworthy a short Chapter, at the End of this our seventh Book, treating of those Plants of Grass or other Kind, which are raised for the Service of the Farm as Food, at Times when other Species are wanting.

Spurrey is a wild Plant in this Country, and therefore will not fail to succeed easily with any Kind of Culture; as it naturally grows in

in our Corn Fields, it shews that Tillage will always be useful to it; and as it will grow in very poor Ground, and come into Service late in the Year, when many other Crops are eaten, it is worth some Notice.

It is a small weak Plant, with little five-leaved Flowers, and a great Number of Seeds following each in a Kind of Capsule. There are five Kinds of it Natives of ENGLAND. 1. The larger or common Spurrey, frequent wild in Corn Fields. 2. The little annual Spurrey, with foliated Seeds. 3. The common little red flowered Spurrey, wild in dry Places. 4. The Sea Spurrey, frequent on our Sea Marshes. And 5. The lesser blue flowered Sea Spurrey.

Of these common Spurrey, and the Sea Spurrey, the first and the fourth Kinds named here, are the only ones worth the Farmer's Notice; and of these the first is the only one at present regarded.

This is a weak Plant, with numerous Branches. The Root is white and small, but full of Fibres. The Stalks are eight or ten Inches long, and divided into many Branches not very erect, tender, and of a pale Green. The Leaves are very narrow, and there stand several of them at every Joint: at the Tops of the Branches stand the Flowers, which are small but very conspicuous, being of a bright milky White.

The Soil that most suits the Growth of this Plant, is a mellow Earth, with a large Admixture of Sand; and it will thrive very well in Exposures, and the most barren Places.

The Ground requires no great Care for fitting it to this Crop. There are two Seasons for sowing it, the first is in MAY, and the other very early in Autumn: in both Cases it shoots very quick, and presently covers the Ground with a green Coat, though in a straggling Manner.

The Use of it is as Fodder for the Cattle, principally Cows; and the Way of giving it, in FLANDERS where it is most cultivated, is fresh cut in Racks. The Produce of the latter sowing comes at a very advantageous Season, the natural Grass in their Pastures having been well eaten by that Time, and recovering itself but slowly.

It is an excellently wholesome Food, and one that Cattle are very fond of: it occasions Cows to give a large Quantity of Milk, and gives it no ill Flavour, as too many of these Things will: it also fattens Cattle of all Kinds, and, as is said, occasions Hens to lay more Eggs than any other Food. 'Tis plain those Fowls are fond of it, and at the worst it never has been found to do them any Harm.

If the Husbandman shall chuse to cultivate this Plant, the Method he sees is very easy, ten Pounds of the Seed, which may be had very cheap from HOLLAND, is the proper Quantity for an Acre: it requires only to be lightly harrowed in, after sowing in the common broad Cast-way, and then will give no farther Trouble till the Time of cutting, which will be in about three Months after the sowing.

We have mentioned among the five Species

of Spurrey, one beside this common Kind, which may be well worth the Farmer's Notice, this is that Sort which grows about our Sea Coasts. It has not yet been considered as an Herb at all profitable, but this is because it is not known among those who should bring it into Use. The Knowledge of Plants is confined to People of Curiosity, it will be very happy if it ever shall be made universal.

This Sea Spurrey, with which we are desirous to bring the Farmer acquainted, is much more worthy his Notice than the other. That we have not greatly recommended, because there are many other Crops, probably most of them superior in Value to it, which will grow on the same Ground, and with not more Trouble in the Culture, but it is not so with Respect of this.

There is nothing we want more than to find proper Growths for our Sea Coast Land, and this is one that Nature has calculated for that Purpose. We have a vast deal of Ground within the Reach of Salt Water, which is therefore neglected; because being impregnated with Saltness, things useful will not grow upon it: there would be a vast Advantage in finding Crops proper for these Grounds; and if they were but of a moderately valuable Kind in themselves, still, because they grow on what would be otherwise unprofitable Land; they would be useful. We see the great Benefit of draining those feeding Grounds which become Salt Marshes, and there will be the same or more in raising Crops of useful Herbs, of whatever Kind, on such as are not fit for that other Purpose.

We find many Pieces of Ground in this Condition, the Soil whereof is too loose and sandy to bear a good Turf. On these, which cannot be made to answer in the common Way of Salt-marsh Ground, the Sea Spurrey might be raised with Profit. There can be no doubt of this, because the Plant grows wild upon them; and I am able to acquaint the Farmer, from Experience, that this Kind of Spurrey is equal to the other so commonly sown in FLANDERS, and at one Time not uncommon in ENGLAND, in its Qualities: let it not seem the Fondness for a Piece of Novelty, that influences me, when I say it is better; for it is as wholesome and more juicy; and consequently every Plant of it contains more Nourishment than one of the other.

This Sea Spurrey, which we propose to the Husbandman who shall be situated near such Land, to cultivate, is not unlike the former in its Manner of Growth, or the Shape of its Leaves or Flowers; but it is shorter, more upright, and has a fuller Stalk. The Farmer will see it frequent on these Sort of Grounds, and will know it without farther Description.

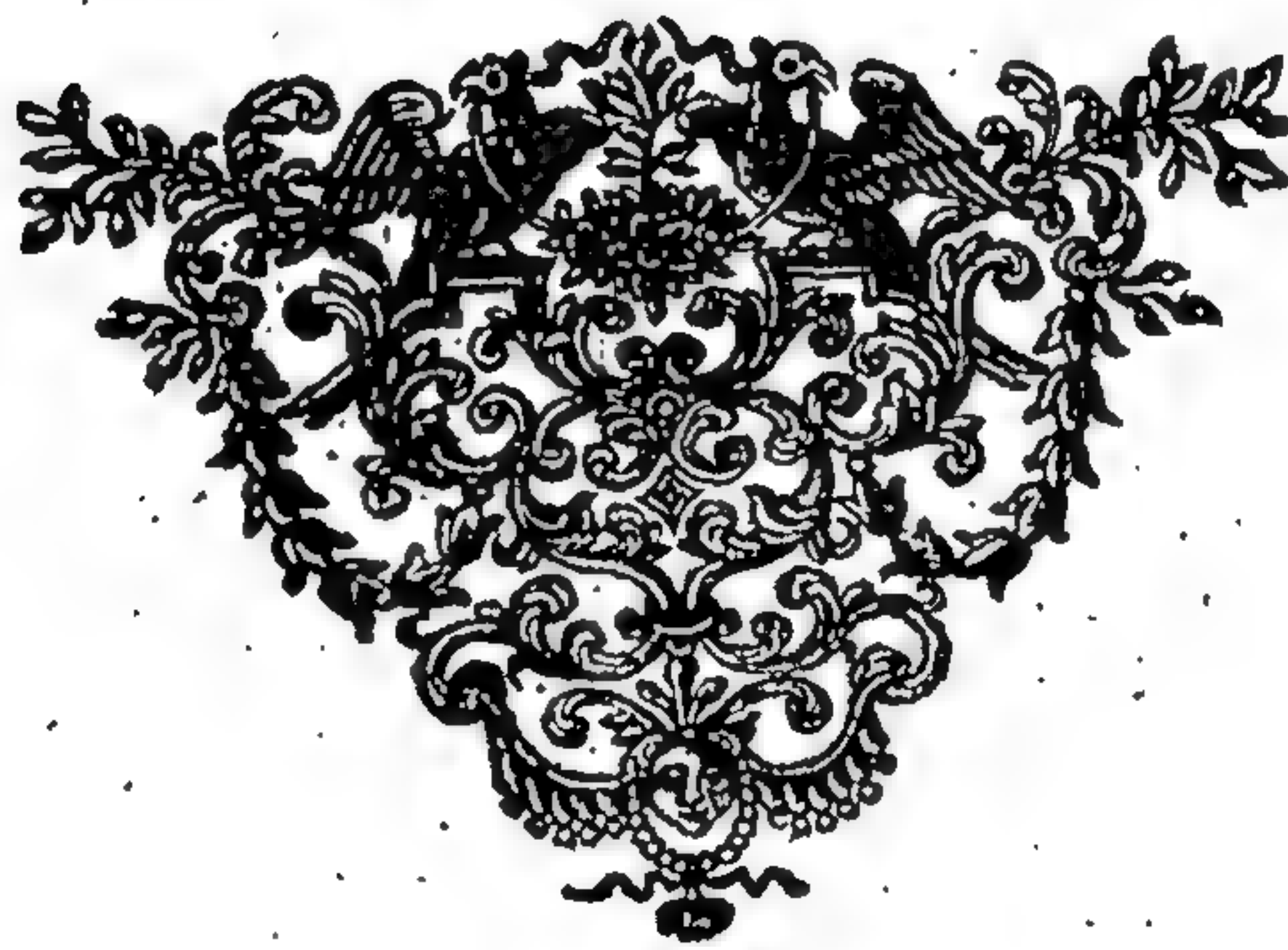
It is so plentiful that the Seed, though it is not to be bought, may easily be gathered in Abundance; a Couple of Labourers in the Month of JULY, being employed one Day for that Purpose, would be able to bring in a vast deal of the wild Plant; it is at that Season very full of the Seeds, and they will freely come out on threshing; these may be sown with

with the least Expence imaginable, and they will that Year produce a large Crop, and that at a Time when it will be very useful.

When the Seeds are got out of the dried Plant, they must be spread upon a Floor to harden; and after a Week they will be fit to sow. That short Compass of Time will be enough for plowing up a Piece of waste Ground, which will need no farther Culture than this. Let it be well turned up by a Plow that will cut deep, and then harrowed over. After this let the Seed be sown by the broad Cast-way, in the Quantity before-mentioned, and then let a Roller be drawn over the Ground, to press it in.

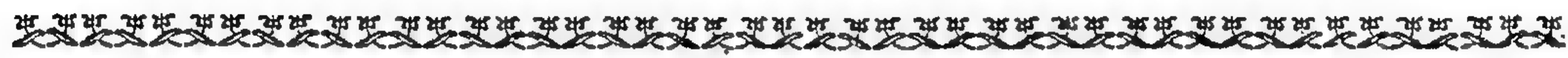
The Land in such a Place is of little Price, all this Trouble and Charge will amount to, in a Manner, nothing, and there will undoubtedly be a Crop. Its Uses being the same with those of the common Spurrey, the Farmer has been told them already; and if it do but equal that there will be Advantage in the Attempt; but he may be assured it will very considerably exceed it. This is one of those Trials we have to propose to the industrious and spirited Farmer, and like all the rest, it may be attended with considerable Good, but can do him very little Harm.

End of the SEVENTH BOOK.





A
COMPLEAT BODY
OF
HUSBANDRY.



BOOK VIII.

Of such Roots as may be advantageously planted in Fields.

IN ELEVEN CHAPTERS.

CHAP.

1. *Of the Soil for Turneps, and Manner of sowing them in the common Husbandry.*
2. *Of managing Turneps in the Ground.*
3. *Of the Uses of Turneps.*
4. *Of certain particular Ways of raising a Crop of Turneps.*
5. *Of the Potatoes.*

CHAP.

6. *Of the Soil for Potatoes, and the Manner of planting them.*
7. *Of the preserving of Potatoes.*
8. *Of Carrots.*
9. *Of the Soil for Carrots, and its Preparation.*
10. *Of sowing of Carrots.*
11. *Of managing a Crop of Carrots, and their Use.*



The INTRODUCTION.

WE have had Occasion to observe in several Places, in the preceding Part of our Work, that the Gardener and Farmer are intrenching upon one another's Province; the Gardener planting his proper Crops in the Field, and the Husbandman employing himself about the Products generally supposed to belong to the Garden. This is no where so much the Case with the latter, as in the present Instance.

We are in this Book to treat of Roots which the Farmer may advantageously cultivate in Fields, but which have been originally, and are in general still at this Time, the Products of the Garden. These he will find it easier to manage than many of his more usual Crops; and we would in this Work let him into the Knowledge of every thing that can be profitable to him. A Field is a great Garden, if he pleases to make it so; and the main Difference lies in the Degree of Culture. For many of the common Products of the Garden the well managed

Labours of the Field will answer; and if he add to these more Expence, and a different Manner of working, he will find it perfectly answered by the Encrease and Value of the Production.

There are many Roots that may be cultivated in Fields, and that are so at present in one Part or other of the World: with all these we shall bring him acquainted, and with their Manner of Culture; but there are three principal Species at this Time propagated, in the Fields of many Parts of our own Country with great Benefit, and which we wish could be thrown into the Farmer's Hand universally: these are the Turnep, Potatoc, and Carrot. The Demand for these is continual and great, so that there is no Danger of over-stocking the Market; and as they bring the Farmer in some Places a very great Profit, we shall endeavour to enlarge that Branch of the Profession.

After these are to be named the other Roots, we have mentioned some of them propagated at present only abroad, and others confined to one or two Spots of the Kingdom; these we shall separate from the present, treating of them

in a succeeding Book, together with those other Products, whether Leaves or Flowers, which are in the same Manner in every Husbandman's Power to cultivate to Advantage, though they are not yet well introduced among us.

Of the three Roots we have to treat of in our present Eighth Book, the Reader is to remember, that we have spoken of the first already, so far as the Drill and Horsehoeing Husbandry are concerned in its Culture; to avoid Repetition therefore, we refer to that Head for many Particulars relating to the Turneps as raised by that Method for the Service of the Stock, and shall here treat of it only as propagated in the Field by the common Husbandry, by which it may always be raised to equal, and commonly to excel in Sweetness, that of the Garden.

C H A P. I.

Of the Soil for Turneps in the common Husbandry, and Manner of sowing them.

A Poorer Soil will do for Turneps in the Horsehoeing Husbandry, but in the common Way of Management we shall advise the Farmer to look upon them as a Garden Root, and to give them what is as near a Garden Soil as his Field will afford. In that Practice fresh Supplies of Nourishment may be given them, by dressing the Ground by Tillage while they are on it; but in the common Way nothing essential can be done to that Purpose, the Turneps are to trust to such Nourishment as is in the Ground when their Seed is committed to it; therefore the richer it is the better.

A good black mellow Earth, with some small Admixture of Sand, or a very rich Loam with a great Quantity of mellow Earth among it, are the most favourable Soils for the Turnep in the Field. We would have our Farmer raise his Turneps to equal those of the Garden, and there is no other Way but by a first good Choice of the Soil. Whatever be the Condition of Land on which they are sowed in other Respects, two Qualities it must have, that it be light and warm, these will prevent the Destruction of the Crop; but we must add the other Quality of Richness, in order to their being well nourished.

Turneps stand a great deal closer this Way, than in the Drill and Horsehoeing Method, and therefore there must be more Richness in the Land that is to supply them. A Soil too sandy is never very rich, this is the material Objection to that Kind of Land, which otherwise, from its Lightness and its Warmth, would be proper; as to Clays, they being heavy and cold, are, of all Soils the worst for Turneps: the other Kind, as they approach more or less to the one or to the other of these, are the fitter or more unfit for the Growth.

The Quantity of Seed for the several different Methods of Husbandry we have mentioned before, and shall add here, that there is a Nicety in covering the Seed which few regard, and Errors in which are the Cause of half the Mis-carriages that happen to Turnep Crops. This

Seed requires to be tolerably well covered, and in particular to have the Earth pressed close about it. From the Want of this single Circumstance, I have seen Crops that had every other favourable Accident that could be named to attend their Growth, come up poorly, and half of them decay afterwards, while the Remainder came to little or nothing.

On the contrary, there is no Danger of squeezing and pressing the Earth too firmly about them; for we have seen very fine Crops of this Root raised, by sowing Turnep Seed in a Barley Field just before mowing. In this Case it is easy to conceive how the Ground must be every where squeezed, by the treading and carrying off the Corn; but this, far from hurting the Seed, has sent it properly into the Ground, and the Stalks of the Barley sheltering it, have done instead of a better Covering.

As we see by this what Degree of pressing Turnep Seed will bear, when in the Ground, we should give it accordingly, but in a more regular Manner. The common Harrow tears up the Ground too much, and buries the Seed too deep; the best Way therefore is, when it is scattered properly upon the Field, to draw a Bush Harrow over the Ground, by Way of covering it lightly, and then to go over it with a very heavy Roller. There is also another Method that may be used for sowing of Turnips, which is, to have a wooden Roller stuck full of short Pegs, then drawing it over the Ground the Seed is to be scattered in, and a Bush Harrow is to be drawn over it afterwards, which will sufficiently level the Ground.

This Article of pressing down the Earth about the Seeds, though very essential to the good Growth of this Plant, is not particular to it, but is of excellent Use in many others; we see something like it practised on many Seeds in Gardening, which they tread in first, and then lightly rake the Earth over afterwards. A good Roller would answer the Purpose of this treading, when the Seed had been in the same Manner scattered over the Grounds, and it would be easy to have the Harrows with short sharp Tines, that should answer the Purpose of their Rakes. This would be a Means of bringing the Garden Method of working, in many Instances, into the Field, and in none it can be more proper, than when Things which are common Garden Products are concerned.

The great Danger of the Fly may be, in some Measure, obviated by a proper Steeping of the Seed before sowing. There is an excellent Receipt among the Farmers for this Purpose, the Success of which has evidently been so great, that it were idle to think of proposing any Alteration in the Ingredients. What we have seen in the Difference of Crops that have been sown with this Advantage, and others in the same Circumstances, the Seeds of which were sown without steeping, makes us very desirous that it should be universally known, and universally followed. The Receipt is this. Mix together equal Quantities of Stone, Lime, and Wood Soot. Have ready a Quantity of Urine, sufficient to moisten them into a thin Pap. Heat a little of the Urine and put to the rest, that it may be all Milk-warm, then mix it by Degrees with the
Lime

Lime and Soot. The Lime will presently flake, and breaking to Pieces, the whole will make a smooth Mass of a thin Consistence, pour this when cold upon the Turnip Seed, let it remain in it four and twenty Hours, and then sow it in the Manner we have directed.



CHAP. II.

Of managing Turneps in the Ground.

THE first Care is to watch the growing Shoots while very young, to see whether they be taken by the Fly. It is impossible to guard perfectly against this Accident, but it is very proper to be upon the Watch, to know it as soon as possible, for it should be repaired by an immediate other Crop.

We have observed before, that this Danger is only while the Turnep is in its Seed Leaf, because these Insects do not regard it afterwards. The Taste of these Ingredients will, in some Degree, hang about the Seed Leaves, so that they will be more likely to escape when it has been steeped, than when sown without that Precaution; but I have seen it sometimes eaten down by them after this Method; and therefore warn the Farmer not to trust to it entirely, though it give him great and reasonable Hopes.

When the Crop has got over this Danger, the next is its being starved by Weeds. Several Kinds of these will grow among Turnips as among other Crops; but there is one particularly mischievous, this is Charlock, it resembles the Turnep so much in the Leaf, and Manner of growing, that it may rise among it in great Quantities unnoticed; nor is it always safe to order it to be weeded out, for there have been Instances of the Weeders taking up a whole Crop of Turneps, and leaving all the Charlock, this being a Time when the Turnep has not got any thing of a Root, whereby it should be distinguished. The proper Weeders at this Season are Sheep, they will distinguish where the Labourer cannot, and what is very singular and very happy for the Farmer, they will, in this Period of the Growth, prefer the Weed to the Crop.

He is therefore first to inform himself thoroughly of the Difference between Charlock and Turneps, which consists in the Size, Colour, and Divisions of the Leaf; and though there be a general Resemblance to an unpractised Eye, this is a very sufficient Distinction to those who will look narrowly. If he find his Turnep Field over-run with this destructive Weed, let him turn in a competent Number of Sheep; and they will eat off all the Charlock, which will never rise to any Height again, and they will leave the Turneps untouched. This might seem a very desperate Undertaking to such as had not seen it practised, but there is no arguing against Experience, and this is a Method that has stood the Test of Ages. The only Caution is, that too many Sheep be not turned in: a very moderate Number will be sufficient for the Purpose, and more might damage the Crop which they did not devour.

The Charlock being removed, the Distance of

the Plants is to be considered; and as they generally rise a great deal too thick from this random Way of sowing, they are to be reduced in Numbers, and brought to this proper Distance by the Hand Hoe. This at the same Time clears off the Weeds, of whatever Kind, that have risen among the Turneps; and they are left by it at a proper Distance, and with a clear Ground fresh broken for their Nourishment. The due Distance for the Crop we have shewn already, and shall not repeat any thing before delivered here. This hoeing is all the Farmer can, in the common Method of Husbandry, do for his Crop; therefore when this is done he is to wait their Growth, as Nature brings them to their Perfection. As they arrive at that there is a Method of using them which will be of great Service, and which is so plain and obvious to Reason, that it seems astonishing it is not universally practised.

The first Use of the Turneps is to feed Cattle under Cover, and for this Purpose a proper Quantity are daily to be pulled up, and carried Home in Carts. I have frequently seen the Farmer's People at work upon this Plan, beginning at one Corner of the Field, and clearing all off carefully as they went on, that by Degrees a good Part of the Field has been left bare, while the Crop was growing on the other. Nothing can be more contrary to good Sense than this Practice. The Farmer has here an Opportunity of bringing his Field into better Condition every Day, and for want of a little Thought it is utterly neglected.

None can dispute but that the Turneps raised by the Drill and Horsehoeing Husbandry, are vastly larger than those in the common Method: this is in a great Measure owing to their Distance. The greatest Advocates for that Practice urge, as a Reason, that the Turneps in the common Way of Culture, are starved by standing too close; and here is an Opportunity of thinning them. When some of them are to be pulled for feeding in the House, the Trouble will be little more to gather them in different Parts of the Field; and the Benefit will be very great.

Let the Persons sent to pull the Turneps, have Orders to draw them in such Manner as to thin the rest of the Crop regularly. The very pulling of them up will break the Ground a little, and every thing of this Kind is an Advantage: the Turneps left in the Field will be thus at greater Distances, wherefore they will grow to a larger Size; so that it is very natural to expect, and it will be answered in Fact, that they will make Amends by their Increase in Bulk, for all that are taken up; and the Crop shall be in reality not diminished in Quantity, but only in Number.



CHAP. III.

Of the Uses of the Turnep.

THE Use of the Turnep at our Tables is sufficiently known, and it were idle to enlarge upon it here. All that the Farmer is concerned to know about it is, that it will always make

make a Demand for them, and that this Demand will be proportioned to his Situation, near or remote from a Market; and according to the Bigness of that Market when he is near one. Of this he is certain that he may, on these Occasions, send a Servant with a larger or smaller Parcel of his best Turneps to Market, according to the Demand, and they will make a very pretty Addition to his Profits.

If he live in the Neighbourhood of a great Town, it will be worth his while to keep his Crop wholly for that Purpose, or to make only such a Reserve of the worst Part, as may be just needful for his Cattle; and he will thus be a Gardener, only in a larger Way: for his Field, managed as we have directed, will supply him with Turneps in every Respect equal to those from the best Gardens. Not to pursue this Consideration farther, we are now to enquire into the best Manner of giving Turneps to Cattle, and the various Kinds that will eat them; the Seasons at which they are most proper, and their several Services.

It was thought at one Time a great Piece of Husbandry, to chop Turneps to Pieces before they were given to Cattle; but this has been found to have had, instead of good, bad Consequences, and is now utterly omitted. This tempted the Creatures to eat them without chewing, by which Means they had not half their Nourishment, and some times they were choaked with the Hurry of swallowing them: chewing is a natural Part of the Operations promoting Digestion. We have many People liable to great Disorders in their Stomach, only from a careless and hasty Manner of eating; and the same Disorders will arise to Cattle from the same Causes, especially to those which eat a Food so uncommon in their natural State as Turnips. The proper Method, on all Occasions, is to give them whole, and it is in general much more profitable to pull them in proper Quantities, than to turn the Cattle into the Field. They eat up more entirely what are given them, so that there is no Waste from their leaving, or from their trampling; and they fatten much sooner when thus kept up, than when they ramble about.

The only Inconvenience attending fattening of Cattle with Turneps is, that it will give a Flavour to their Flesh: but this is easily remedied, by feeding them at least ten Days or a Fortnight with Hay; in which Time the Effect of the former Food, as to Flavour, will be entirely gone off.

Some Creatures have been supposed to be incapable of fattening with Turnips, because they do not readily take to them; but these must be humoured into it. We have observed already, that the Turnip is not one of the common or most natural Foods of many of those Animals, to whom it is very wholesome. When any Creature the Farmer has a Mind to feed with the Turnip, does not take kindly to it at first, the Way is to boil it. And thus it will often go down, after which, the Taste being known, it will be very well relished raw.

If the Farmer be in Fear of the Fly for his Crop of Turnips, he may use some Precaution beside what we have directed, in the steeping of

the Seed: Wood Ashes are found very destructive of this little Insect; it is therefore a good Method to scatter a Parcel of these thinly over the Crop, just after the Plants are above Ground: it will often preserve them; and is so far from doing Harm that it will always promote the Growth.

After this Fly, the greatest Enemy to the Crop of Turnips, is the Caterpillar. It is a particular Kind that seizes upon the Turnep Leaf, and this only devours it while young. It is a small black Kind, that will be found very plainly when it is in sufficient Number to do Mischief; for it can do this no otherwise than by the Multitude, like the Fly. When these are seen the Weather is to be consulted, for in a dry Season they may be destroyed at once by proper rolling, but in wet Weather that Instrument must not be brought upon the Ground. Therefore, if the Condition of the Land, and of the Air, permit, let a Roller be drawn carefully over the whole Ground, very early in a Morning. The Caterpillars will at that Time be out on their Food, and their Bodies being tender, the Roller pressing heavily, and the dry Earth making some Resistance, they will be utterly destroyed. This Pressure of the Roller, far from injuring the Turneps, will make them root the better.

The naked Snail, or as it is commonly called, the Slug, is also very troublesome on these Occasions. If it be at a proper Time of the Growth, the Roller used in the same Manner, will destroy that also; but if the Turneps are at such a Growth that the Roller cannot be taken on, then the Method is to turn in some Ducks, they are fond of these Creatures; they will do no Harm to the Turneps; and their Dung will help the Ground.

These are the general Methods of raising the Turnep, and of preserving it in its Growth.

But beside these are some other Methods, approved by Experience, and worth the Farmer's Notice.

C H A P. IV.

Of particular Ways of raising a Crop of Turneps.

FIRST, there may be a very good Crop of Turneps got by sowing them upon the Stubble, as soon as the Corn is off. The Seed, in this Case, is only to be harrowed in, and the Crop reserved till late in the Spring, for the Food of Ewes and Lambs. If the Land be intended for Fallow, in the open Field Countries, they may very well stand on it till APRIL, which will make a Supply for Sheep at that Time of the Year, when Provisions are most scarce of all. A great deal of the Success of this Crop depends upon the Season, for if the Winter be very severe it often comes to nothing; if mild it seldom fails, and in the other Case the Loss is trifling.

Another Method which has been practised with great Success, is to sow the Turnep Seed pretty thick among a Crop of Hog Pease, just when they are ready to cut. No more Care need be taken in this Case, beside the scattering the Seed

Seed in proper Quantity over the Ground, among the Pea Stalks, but this Quantity must be as we have said, larger than is commonly allowed, because some will certainly be lost. The Reapers are then to be sent in with their Hooks, and no particular Orders need be given them concerning the new Crop. Let them cut and carry off the Pease in the usual Way, and the natural and necessary treading of the People's Feet will crush the Seed of the Turneps into the Ground, and press it down a little, which is every Way assistant to the Growth of this Species.

In this Manner, when the Pease are off, and the Ground has been a little at Rest, the Turneps will shoot up, and they will be in less Danger of Insects at this Decline of the Year, than they would have been in the wet and warm Part of Spring; if they appear the same Methods may be used to destroy them, and, one Way or other, the Farmer has a fair Chance for a good Winter Crop.

When they are at some little Height they will require to be hoed by Hand, for two Reasons, the one is to thin them, the other to break the Ground about them. The Weeds are destroyed in Consequence, but this is a lesser Consideration, for at this Season they are fewer than in Spring.

The Necessity of thinning the Crop is greater in this Way of raising them than in any other, because they will rise more irregularly; and when they are very thick in some Parts, and other Spots are entirely vacant, as will be the Case, they should be taken up and transplanted. The Earth being trod very much, and not broken up, requires this hoeing also, for otherwise it will be too hard. It answers the Purpose of the Seeds, because the Pease have made it mellow.

Another very useful Way of raising a Winter Crop of Turneps, is upon a Piece of Ground where there have been Beans: but in this Case the Method is to plow up the Land once, and then harrow in the Turnep Seed. Either after Beans, or a Crop of any Kind of Corn where it has grown thick, the Ground is so hollow, that once plowing does very well to prepare it for Turneps; and by any of these Methods, if the Winter prove tolerably mild, there is no Doubt of a profitable Crop, but otherwise these late sown Turneps frequently suffer.

CHAP. V.

Of the Potatoe.

THE Potatoe is an extremely useful Root, and one that may very properly be cultivated in Fields. It is indeed fitter for the great Extent and plain Fashion of a Field, than for the narrow Compass and divided Beds of a Garden, when we consider its prodigious spreading. 'Tis but lately we have informed ourselves properly of its Culture; and the more we know of that, the more Reason we see to banish it the Garden, and introduce it into the Field. It is hardly enough to bear the Exposure, and it requires no great Charge in the Culture and Management; why then should we limit it to the Garden, every

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Particular speaks for its being given into the Hands of the Farmer, especially when near large Towns, though every where there will be a great Demand. We shall therefore lay him down such a Method for their Management, that he cannot fail, by observing it strictly, to meet with a Success that will make him keep up the Culture of this Root at all Times.

The Potatoe is a Plant of a singular Form and Manner of Growth: the Botanical Writers refer it to the Nightshade Kind, calling it Nightshade with the tuberous eatable Root. It is singular, that one of the most innocent Plants in the World, should belong to a Class naturally and generally poisonous, but these are Matters where with the Farmer has no Concern.

The Root of the Potatoe is composed of several large roundish Lumps, joined to one another by Means of Strings, and spreading a great Way in every Direction. The Stalks are numerous, three Foot high, branched, and full of Leaves; these are divided into several Parts, or each is composed of several Pairs of smaller, with an odd one at the End, but the Division or Disposition is irregular. The Flowers are large, and either of a dusky purplish Hue, or white, this being a trifling Variety, from which, as also the Colour of the Outside Skin of the Roots, the Potatoe is divided into two Kinds, under the Name of the red and white: the Fruit is a large Berry.

We had this Plant originally from NORTH AMERICA, and at this Time raise it in vast Plenty, and to a very great Profit. It is in a Manner the Food of the common People of IRELAND; and is cultivated in LANCASHIRE, and some other Parts of England, in vast Quantities. Our Intent is to make it more universal.



CHAP. VI.

Of the Soil for Potatoes, and the Manner of planting them.

MORE depends upon the chusing a proper Soil for Potatoes, than for almost any other Root. Not but it is hardy, and will live any where, but it will not spread and propagate its Roots, unless the Soil suits. It is the Farmer's Interest to consider this Particular in the most careful Manner.

There are but few Soils that will answer, in the right Manner, to the Potatoe; and those that do, yield such a prodigious Encrease, that on both Occasions it is worth considering strictly. The first Quality the Soil for Potatoe must have is Freedom and Openness, the second is Richness, and the third a due Degree of Moisture. This shews us that the best Soil of all for them is a mellow Earth, or good fine Mould, in the Condition wherein we most frequently see it, which is light, deep, and with some Moisture; this points out a Part of the Kingdom for the Propagation of Potatoes, where they are very little regarded at present, the Northern Edge of NORTHAMPTONSHIRE, and the adjacent Country. They have there this Soil in great Perfection, it is in some Places too wet, but there it would not

answer,

answer, the Place is where the Moisture is moderate.

After the mellow and pure Earth, the Soil most favourable next is a rich Loam: this will supply them very well alone, if it be of the richest Kind of this Earth, but if not it is to be mended by Dung.

By this Direction as to the Soil the Farmer is to chuse, he will know what he is to avoid; and first of all Clay is to be shunned, because it will not suffer the Roots to spread; and Gravel, because it will not supply them with Nourishment. Chalky Soils are also improper for the same Reasons as Gravel, because there wants Nourishment; as to the sandy Kind they fall under the same Fault of Poorness, but they are open and free for the spreading of the Roots; and on some Grounds of this Kind, that have not been too absolute a Sand, improved a little with Manure, I have seen very good Potatoes.

The red Potatoe succeeds best upon the sandy Soil: but it never equals that on the rich Loam, less still that on the mellow Earth. The different Effects of the Soils we have named are these, the Clay will not let the Roots spread; and the sandy, though they give the spreading Room, will not feed them sufficiently; the light mellow Earth produces therefore the largest and the most numerous Roots.

There may be an easier Improvement made in the sandy Soil, than on any other for this Use. The laying on, from time to time, a proper Manure, will bring it into a good Condition, as one naturally fine. The best Manure is rotten Dung and the Mud of Ponds, this, mixed in a good Proportion, and laid on freely, will bring a Piece of sandy Ground, that has any natural Richness of its own, into the Condition of the finest loamy Soil whatsoever; and there is but one, as we have shewn, superior to that for the raising this Root well.

The Soil being chosen the Potatoe is to be planted, and in the doing that there is no great Difficulty; however, the Farmer must exactly observe the Directions, or he will fail in his Crop.

This being a Kind of Garden Root, let the Garden Practice be so far observed, that the Ground be well broken and prepared for the Reception. Let it be plowed in a careful Manner, considerably deep, and so as to break the whole Soil.

Let there be Trenches or Furrows cut across the Field, six Inches deep, and a Foot asunder; in these the Farmer is to lay regularly and carefully, the smallest Roots of Potatoes he can get, but with a very particular Care that they be fresh and fine. They must be placed in these Trenches six Inches from one another, and covered up by harrowing the Ground all over.

This is to be done in the latter End of FEBRUARY, and the Land is to be left in this even Condition till the Potatoes shoot, and the Weeds among them.

When these are up at such a Height that they can be well distinguished from the Shoots of the Potatoe, the Hoers are to be sent into the Field, to cut them all down; and in doing this they will break and divide the Surface of the

Ground so, that the Rains and Dews will get in, and the Crop thrive upon it immediately.

When the Weeds have once again got up to a Height, as they soon will from the Wet and Warmth of Spring, the Hoers are to go in again and clear all away.

After this no more Care is requisite, the Stalks of the Potatoe will now be so high and so strong, that they will suffer no more Weeds to grow among them.

This is all the Culture and all the Care the Potatoe requires; and nothing can be more easy. Here is no particular Expence in preparing the Ground, no great Charge of Stock or Labour; and there is no Hazard of Success. The Sale is certain, and the Profit absolutely very great. One Summer brings the Crop to Perfection, and there is no one Shadow of a Reason against the Farmer's raising them.

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## CHAP. VII.

### *Of preserving Potatoes.*

OUR Crop has been put into the Ground in the End of FEBRUARY, and it requires no more Time for its Encrease than to the latter End of SEPTEMBER. Indeed no more than this can be allowed it, for the Potatoe should always be taken out of the Earth, before there be a Possibility of Frosts that could hurt it. During the Summer it is free from any Danger, and in Autumn it is to be taken out of the Ground.

Toward the Middle of SEPTEMBER let the Farmer begin to take up his Potatoes, and let him begin with that Part of the Field that lies most exposed, leaving till afterwards that Part which is most sheltered: he is thus to begin and to continue taking them up, Parcel after Parcel, once in two or three Days, as there is a Demand for them: but when he perceives the Ground first affected to any Depth by the Frost, he must at once get up all the Remainder, for this is an Accident that will always hurt them.

As he will perceive the Season of the Frost approaching, he must prepare for it by providing a Place where to put his Potatoes, when he shall take them up. A Cellar, with a good Quantity of Sand, will answer this Purpose, and he will thus be able to preserve them from Frost: taking out what he has a Demand for, as he wants them, and reserving the smallest, which will bring him least at Market, for planting in the Spring.

This is the whole Care requisite. As to the Produce it will be greater than those can easily believe, who are not much accustomed to such Things: it will depend upon the Soil, as we have observed already, but the Difference is so great, that the Expence of well dividing and breaking the Land by Tillage, and well enriching it by Manure where requisite, will be very amply returned. The Size as well as Number depending on these Articles.

Ten tolerably large Potatoes is but a moderate Produce, from each small Root that was planted in Spring; when the Ground is more favourable, thirteen or fourteen handsome ones; and on

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counting, with the best possible Exactness, in a Field of Mr. RYDER's near THORPE, where every needful Caution had been taken; we computed this Year, 1746. that there were in general eighteen large and fine Potatoes for every small Root planted. This, for a seven Month's Encrease, is very great; but Nature has in all Things provided, that whatever is most useful is most abundant.

The Consequence of the Frost taking the Potatoe, is a Kind of Dissolution of its Substance, it runs to Water and rots.

The Approach of Frosts is a plain Direction, but the Decay of the Stalks, and the Condition of the Plant, will not fail to give the Farmer an earlier Notice. About the Middle of SEPTEMBER the Plant entirely ripens, and after that it quickly fades. The first Frosts which we do not feel, affect Plants, and in this Case they attack the Stalk and Leaves, before they penetrate the Ground so as to come near the Root. When the Farmer sees the Leaves yellow, and the Berries of a dead ripe Colour and dropping, he may take Notice that the first Appearance of Ripeness in the Root is come. Let him begin to take up at that Time, and continue till all are out of the Ground.

It has been proposed, by some who are fond of Schemes, and presume to call any Practice that is new, an Improvement of Husbandry, to cut off the Tops of the Potatoe as soon as they grow poor and fade, in order to preserve the Root from Frosts. I have seen this tried, and it is fit I warn the Farmer from repeating such a Project. It let in the Frost to the Roots where I saw it experienced, much sooner and more powerfully than it otherwise would have been, and the Consequence was the Loss of great Part of a very good Crop of Roots.

The Tops in this Instance were mowed down very clean with a Scythe, and there could be no better Way proposed, but the Effect was just contrary to the Improver's Expectation, though very conformable to what might have been expected from Reason, for certainly Nature here is the best Adviser.

The Potatoe very difficultly preserves itself against the first Frosts of the Winter, but it will be sheltered by the Quantity of dead Stalks and Leaves of its own, that lie upon the Ground; which will serve as the laying of Straw and Pease Haulm about early Plants, a Practice very well known for its Effects by all Gardeners: then, on the other hand, the cutting off the Stalks not only denies the Roots the Protection and Defence of their Covering intended by Nature, but lets in the Frost directly to them, through the cut Part of the Stalks. This is an Effect so agreeable to Reason, that one would wonder the other Thought could ever have entered into the Head of any Person in the World.

The Advantage of the Potatoe lying as long in the Ground as may be, is that it all the Time is encreasing in Bigness, at least till Frosts come, and the Encrease in Bigness is Encrease in Value.

Some have ventured their Potatoes in the Ground all Winter, covering them with Fern and other such Matters, beside their own Straw;

but this is hazardous, and of no Use. The Potatoes may thus be preserved through the Winter, but they will not grow in the least, and there is some Danger that they may perish in spite of all the Covering. The Nature of the Field must finally determine the Farmer who is enclined to this Expedient, whether he shall venture upon it or no, for there may be Differences in Soil and Exposure, very essential on this Head. The more Wet there is in the Grounds the greater the Danger; the sandy Soils therefore are fittest for this Purpose. A Field may be so situated, and of such a Soil, that the Ground may serve as Sand, and the Enclosure keep it as warm as a Cellar; but in this Case there is no Advantage, though there may be little Hazard; some Sand in a Cellar keeps them more securely, and they will no more grow in the Field than there.

When the Time of taking the Potatoes up is come, the Farmer must send into the Ground a Man or more, and to every Man one or two Women, or grown up Children; the Man must have a strong three tined Pitch Fork, with which he is to dig up the Potatoes, and the Women and Children are to follow him, picking them up, and carrying to Heaps that they may be conveniently taken off the Ground together.

When they are got Home they must be cleaned, and lightly washed, and after this dried two or three Days in the Sun, they will then be fit for Market or for keeping.

Beside the Way of keeping in a Cellar, Potatoes when the Quantity is very large, may be preserved during the Winter, in a Pit made in the Ground, but this must be done with great Care and Circumspection. The Farmer who intends this Method, must see for a dry Place, where the Soil is of a warm Nature, and there is good Shelter. Here he must dig his Pit or Ditch, and the best Method is to make it in Form of a Ditch, three Foot wide, five Foot deep, and line it on the Sides and Bottom with dry Wheat Straw. This done the Potatoes are to be carefully put in till the Ditch, which is to be long in proportion to the Quantity, be full up to the Level of the Ground; a Quantity of Straw is then to be put over them, and on this is to be raised a Ridge of very dry Earth. In this Manner they will keep throughout the Winter, and be ready on all Occasions.

Where the Ground is a perfectly dry Sand or Gravel underneath, the Potatoes may be kept very well in Pits, dug for that Purpose; and thus they are preserved with Sand for the Supply of the LONDON Markets, in those Parts of Essex and other Counties where they raise most for that Purpose.

For the Sake of the Farmer who shall design to have large Concerns in this Article, I shall give some short Hints respecting a particular Kind of the Potatoe, which though less observed by the Planters than it deserves, has Advantages quite separate from the others.

We distinguish the Potatoes into two Kinds, the white and the red; but we may very well add a third, which is this of which I speak, under the Name of the yellow.

Whoever is accustomed to deal largely in this Root, must have observed that there is a yellow Kind,



Kind, which is usually very large and thin skinned. This though less known among us, or less regarded, is kept separate by the IRISH, who are more used to this Root, and prefer it to both. Its Size is not the only Difference, or the only Advantage.

We have seen that the great Danger in Potatoes, is the losing them by Frosts: the Reason of this is their shallow rooting, though we plant the first Roots at six Inches deep, those which spread from them will rise to the Surface, and it is this exposes them so greatly to the Frosts. It is particular to the yellow Potatoe, that it roots deep: the several new Roots are generally deeper in the Ground, than the first was planted. This is a vast Advantage, for they will be safe when the others are destroyed. Every one knows the general Use of Potatoes among the IRISH: they never take them out of the Ground in Winter, but as they want them, in many Places, but it is because they propagate this yellow Kind; for the others would be destroyed often there, as well as here, because of their shallow rooting.

This Kind is in IRELAND called the MUNSTER Potatoe.

This Kind will last in the Ground a great many Years, because of its deep rooting; but though the Practice in IRELAND, and in LANCA-SHIRE in some Degree, authorizes this Method, I shall advise the Farmer utterly against it: I have always seen this Root, like other Things, flourish best in a new Plantation, for which Reason I shall advise the Farmer always to clear, and new till the Ground once in three Years, that he may have its full Advantage. I shall also advise him against the common Practice in some Places of planting Pieces of Potatoes, instead of whole Roots; it is true that Pieces with any Eye to them will grow, but whole Roots always succeed much better.

#### C H A P. VIII. Of Carrots.

THE Carrot is the only Root we shall mention farther in this Place, reserving such as are less commonly known, to the succeeding Book. This is a Root as fit for the Field as the Garden; requiring very little Culture, and producing a very great Profit to the Planter. It is hardy enough to stand all the Attacks of Cold, and other natural Accidents. And though in some Parts of the Kingdom, only hitherto kept in Fields, is very worthy to be introduced in the Husbandman's Catalogue every where, and is indeed, for many Reasons, fitter for the Field than the Garden.

The Root of the Carrot is long and thick, varying in Colour from the deepest Orange to the palest Straw, and having every Tinge of red or yellow. The Leaves are large, and divided very beautifully into a Multitude of minute Parts. The Stalk, when the Carrot gets to flowering, rises in the Midst of the Leaves, and is four Foot high. The Leaves stand irregularly on it, and are like those at the Root, only smaller and paler. The Flowers are little and white,

they stand in a large rounded hollow Tuft at the Tops of the Branches, and are followed by Seeds that are numerous, small, pale coloured, light, and rough.

This is the general Description of the Carrot, which from its Flowers growing in a Tuft, like an Umbrella, though less so than many others, is one of those called by Authors Umbelliferous Plants.

We have observed that there is a Variety of Colour in the Roots of the Carrot, from the deepest Orange to the palest Straw, or Sulphur Colour: the Gardeners have hence, according to their Custom, made what they call three principal Kinds of Carrot, taking the three most distinct Degrees of Colour, the deepest, the middle, and the palest. These they call, 1. The dark red Carrot. 2. The Orange Carrot. And, 3. The white Carrot. The first and last of these Terms are somewhat improper, the first Kind being only a very deep Orange, and the other only a very pale Yellow.

The first is the most generally esteemed: People who are critical in these Matters, usually preferring the deepest coloured Carrots; the white Kind is more common in FRANCE and ITALY than here; and though Custom give the Preference, the contrary Way is the sweetest and finest flavoured of them all.

This however is not to influence the Farmer in his Choice. He is to cultivate not that which is best, but what People think so; and therefore he is to chuse the deep red, commonly called the SANDWICH Carrot.

This, with the Management we shall direct in the ensuing Chapters, will never fail to return to the Husbandman a very considerable Profit, at a very moderate Expence.



#### C H A P. IX.

##### *Of the Soil for Carrots, and its Preparation.*

THE first Thing a Farmer must do who intends to plant Carrots, must be to examine whether he have proper Ground, for without this there is no succeeding: those Plants whose profitable Part is the Leaf or Ear, may be raised on very different Soils, by the Assistance of Manure; but these which depend on the Root can never come to any thing, when the Ground is not proper in its own Nature.

Three Things are requisite in Land for Carrots. It must be deep, rich, and dry. These do not so often concur as the Farmer might be inclined to wish. Deep and dry is common, because all sandy Soils have it; and therefore in general they are fit for Carrots; but to be rich withal is the completing of the Business: the other will give Room to penetrate and Warmth to cherish; but when Nourishment in Abundance is joined with these, in the Richness of the Land, 'tis then the Ground is compleatly proper.

For this Reason a fine rich deep Garden Mould, where there is not too much Moisture, is very proper for them; but too much Moisture is the

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common Fault of this Kind of Ground. Therefore to speak from Experience, I shall declare the very best Soil for Carrots to be a rich Loam: that is, a dry Earth, in which there is a great deal of Sand, a good Quantity of mellow Earth, and a very little Portion of the Clay. Some of this there is in all Loams, but the less the better on this Occasion; I have seen excellent Land for Carrots in NORTHAMPTONSHIRE and LINCOLNSHIRE, upon those rising Grounds adjoining to the Fens, and just raised above them. And in SURRY and SUSSEX there are vast Tracts of Ground left in a Manner desart, which would yield a great Profit from Carrots. It is in these Instances we see the vast Advantages that would arise from making the Knowledge of Husbandry universal; the putting into the Thoughts of Farmers in one Place, what is the profitable Practice of another on like Soils. We hope this Work will be instrumental to that excellent Purpose.

The Soil being chosen, the Preparation of it consists in two Articles, the enriching it by Manure, and the breaking it deep by Tillage. All Land for this Purpose will answer the better, the more Care is taken of it in this Respect; and we shall shew the Manner of doing it; for otherwise all the Expence may be worse for the Crop, than if the Land had been left in its natural Condition.

The Times of these Preparations are to be very different; as to the plowing and dividing of the Land, that should be done just before the Seed is sown; but the Manure must be laid on a Year before. This will occasion no Loss of Time with the judicious Farmer, for he may have a vast Crop of some slight rooting Plant, as the small Pulses mentioned in our last Chapter, or such others which will mellow the Ground by shading it with their Stalks, at the same Time that they yield him a great Encrease, without exhausting the Effect of his Manure. After this the Land being plowed up for Carrots, will be in the best possible Condition to support them.

The Reason of this Management of the Dung is very plain: the Carrot will have great Advantage from the Richness it gives the Ground, for the richer that is the larger they will be; but then fresh Dung always subjects the Land to be full of Worms; and this is what should be feared more than almost any other Accident, in a Carrot Plantation, for these Roots are a very luscious Food for those Insects; and when Worm-eaten they are worth little.

For this Reason none but old and well rotted Dung should be used; and that should be laid on the Year before.

When the Ground, naturally of a rich, light, and warm Nature, is thus improved by a well mixed and well rotted Manure, it is to be wrought for Carrots.

According to the old Husbandry this could only be done by Hand, but this is an Article wherein we shall propose to the Farmer great Improvement. The Ground requires to be dug very deep for Carrots, because their whole Value is their Length and Straitness, which they will never attain if they have not a free Passage down for their Roots. For this Reason the old Practice was to dig the Ground with Spades, and

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this was reasonable, the Carrots requiring it to be well broken two Spit deep, and no Plow then in Use answering this Purpose:

This was in a Manner bringing Gardening into the Field; but that is not what we mean by recommending to the Husbandman the Culture of Garden Roots. If they can only be propagated in Fields at the same Charge as in Gardens, there will be little Profit to him, and it is only leading him out of his Way; we should not have named the Carrot as one of the Roots he may cultivate to Advantage, had we not intended to put him in a Way of doing it with the proper Implements of his Profession.

The four coultered Plow will, in this Case, perfectly well answer the Purpose of the Spade; and this at one Stroke reduces the whole Expence, and throws the Article directly in the Way of the Farmer.

When this Plow is well managed it cuts full two Spit deep, so that it perfectly answers the Purpose of this expensive digging by Hand; and by the Means of its numerous Coulters cuts, divides, and breaks the whole Substance of the Soil, even better than the Spade.

## CHAP. X.

### *Of sowing of Carrots.*

THE Farmer is to make it his first Care, when he thinks of sowing Carrots, to procure good Seed: this he will know by its sweet Smell, its pale Colour, and its Roughness: if it be musty or broken, 'tis damaged or old, and in either Case will greatly disappoint him.

The Seed being chosen, he is to get to work upon his Ground in the Beginning of MARCH. Gardeners sow Carrots in a Manner the Year round, that they may have Crops of young ones one under another; but this the Farmer has nothing to do with. He sows them for two Considerations, which are, to have large Roots for Market, and to get good Seed from proper Parts of his Ground, which is also very abundantly produced, and yields a very large Price.

The Beginning of MARCH therefore is the Time when he is to prepare by plowing. His own Reason will direct him never to chuse a stony Soil for this Root; but he must have a Couple of Women or Boys to follow the Plow, to pick up any loose Stone or other hard Matter that may chance to be turned up.

When the Ground is thus deeply cut up and picked, the Harrows are to be sent in, and the Surface is to be well leveled like the best prepared Border in a Garden: this done it is ready for the sowing. When the Seed is a material Consideration the Plants are to be kept farther distant, and the driest and warmest Soils are best for this Purpose.

There must be a great deal of Care in sowing Carrot Seed, and a proper Day must be chosen, otherwise it will be impossible to do it as it should be. The Weather must be still and calm, and the Person who sows them must go over all the Ground carefully, with the Seeds in his Apron, and must spread them by Hand a few at a Time,



Time, and he must take Care that they fall separate, for their rough Surfaces make them very apt to hang together. When any of them cling to one another, he must rub them in his Hands before he delivers them to the Ground, and by that Means thoroughly separate them. His next Care is to see that they fall tolerably regular. And as to the Manner of their lying; one about every three Inches is the best Method, not that the Carrots are to stand so close, but there should be Seeds enough sown that Accidents may be allowed for, and the Plants thinned by hoeing.

As soon as ever the Seed is upon the Ground, let a good heavy Roller be brought on, and the whole Field well rolled over with it. This settles the Seeds in their Places, and prevents the Effect of the Winds, which would spread them irregularly should any rise before they are thus fixed down.

This done, a very fine and short toothed Harrow should be drawn lightly over the Ground, and then the Article of Sowing is finished. In these fine and well prepared Lands, the Harrow does not bury the Seed as it will where there are great Clods to be torn up. In this Case the rolling and harrowing only answers to the treading in, and raking of the Seed in the common Practice of Gardening; and they shoot up as regularly this Way as the other.



#### C H A P. XI.

##### *Of managing a Crop of Carrots, and their Use.*

**T**HE Seed being in the Ground, is to be left to Nature for its shooting, and as soon as it is up, and got to some little Height, the Hand Hoers are to be sent into the Field. They must have Orders to cut up all Weeds, and thin the Plants. The proper Distance at which they should be left, is about seven Inches from one another; and thus they are to stand till they come to their Perfection; for the Ground having been once well weeded in this Manner, the Carrots will grow so vigorously, that their Leaves meeting every where one with another, will overspread the whole Ground, and let no more grow between them.

The Carrots thus left to themselves will grow to a very good Size by the End of Autumn, and they will thrive the better if Quantities are pulled for Market, from time to time, when they are big enough to be saleable, not drawing these all in one Place, but from those Clusters where they happen to stand thickest.

Toward the End of NOVEMBER the Leaves of

the Carrots will begin to decay. The Farmer will know this by their becoming yellowish or reddish, this is his Notice for taking up the Roots. The Carrot like the Potatoe should be taken up in the Beginning of Winter, and laid by in dry Sand, in which Manner they will always be kept ready for the Market.

The Frost hurts Carrots in the same Manner as Potatoes, though not so early or so readily; therefore, as soon as that Time of the Year approaches, when they are to be exposed to the Hazard, they must be taken out of the Ground and laid up in Sand, which Frost does not so much effect as any other earthy Substance; and this must be in a dry Place, where they are defended from it in the best Manner.

This is the whole Management of the Carrot; it is easy and familiar in the greatest Degree; and the Profit is great and certain: there is always a Market for this Root, and the Price is such that the Profit proportioned to the Land and Labour is very great.

We have said, in the Beginning of this Account of the Carrot, that the Root is not the only Article by which it is serviceable to the Farmer, for that there is a great deal of Profit from the Seed. This is the Produce of the second Year, and for this Purpose the Plants may be either left in the Ground during the Winter, or set in again in the Beginning of Spring.

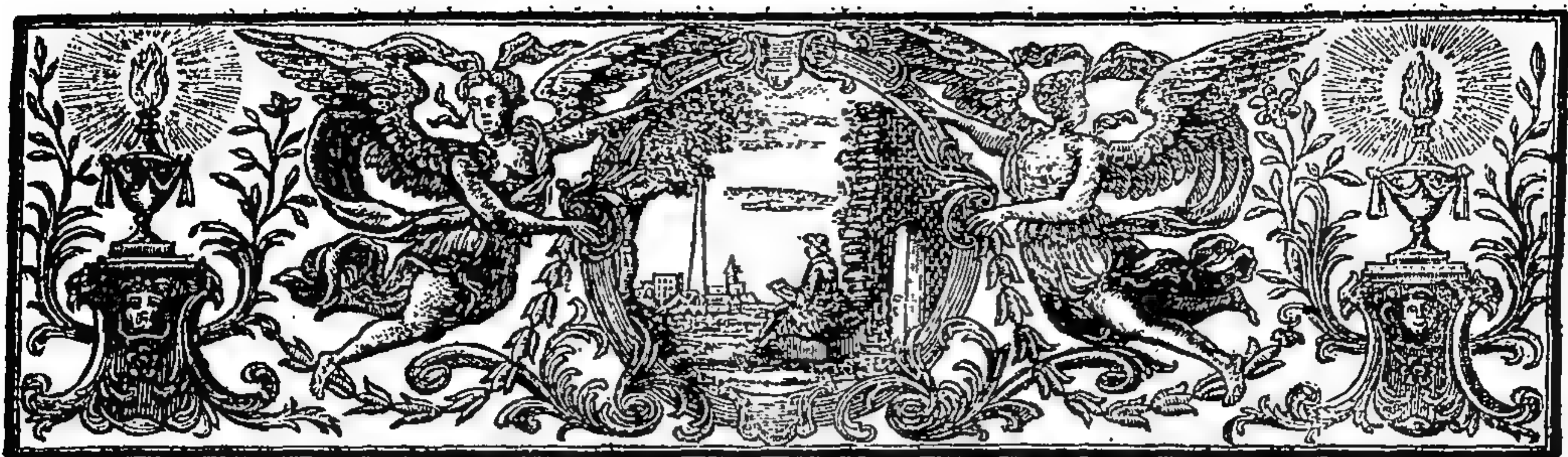
The Gardeners use the latter Method, but the Farmer will find the other best, because there is less Trouble; only he must take Care that he chuse the driest and warmest Part of the Field for that Purpose.

If the Carrots for Seed are planted, after being kept in Sand during the Winter, the largest and finest Roots must be chosen for that Purpose: in the other Method, of letting them stand through the Winter for that Use, the most vigorous Plants must be left. These are to be kept at a due Distance, by separating them in drawing the others. The driest and warmest, and best sheltered Part of the Field, must be chosen, and they must be left at about a Foot asunder, in this Condition they will gather Strength during Winter; the Stalks will rise early the ensuing Summer; and the Seeds will ripen in Abundance about the Middle of AUGUST.

When thoroughly ripe the Plants are to be cut down with an Hook, and laid in the Sun and Air four Days to dry, frequently turning them. After this they are to be thrashed, or the Seeds are to be beaten out of them; and when separate they are to be aired and dried several Days before they are put up for Sale; they will thus be perfectly fine, sweet, and well coloured, and will bring a large Price.

End of the EIGHTH BOOK.





A  
COMPLEAT BODY  
OF  
HUSBANDRY.



BOOK IX.

*Of several advantageous Articles in Husbandry, which are less universal than the others.*

CHAP.

1. Of Hops.
2. Of the several Kinds of Hops.
3. Of the proper Land for a Hop Ground.
4. Of placing the Hills.
5. Of planting the Hops.
6. Of dressing and managing a Hop Ground.
7. Of polling the Hops.
8. Of inspecting the Polling and Growth.
9. Of tying the Hops.
10. Of clearing the Ground, and raising the Hills.
11. Of shortening the Plants.
12. Of gathering the Hops.
13. Of the drying of Hops.
14. Of drying Hops in the FLEMISH Manner.
15. Of drying Hops in a Malt-Kiln.
16. Of drying Hops in a Kiln prepared for that Purpose.
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19. Of dressing an old Hop Ground.
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23. Of the different Kinds of Flax, and the Choice of the Seed.
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31. Of the sowing of Hemp.
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55. Of



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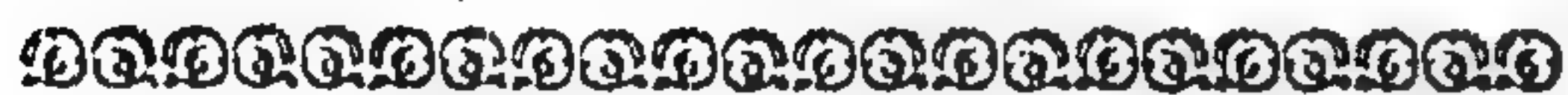
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## The INTRODUCTION.

**T**HE Title we prefix to the present Part of our Undertaking, shews the Sense we entertain of its Importance, in a Work of this Kind: 'tis to the Misfortune of the Husbandman, when any thing that is in Reality advantageous, is not universally known, or generally practised. We shall recount several Kinds of Crops under this Head, that deserve to be made common throughout the Kingdom; and shall lay down such Rules for their several Managements, that those who try carefully cannot miss of Success.

We shall begin with one Species, the Value and Profits of which are sufficiently known, in those Parts of the Kingdom where it is commonly raised: this is the Hop; and this, as it may be cultivated to the great Benefit of the Farmer, in many others, we shall hope to render more general.



## CHAP. I.

## Of Hops.

**T**HERE are few Things by which the Husbandman may enrich himself more than Hops; but there requires a general Knowledge of their Nature, the Ground they suit, and the Accidents to which they are liable, in order to his entering upon the Design with a rational Prospect of Success. The Management of them in the Planting, Growth, and Gathering, is also a peculiar Branch of the Business. This is at present confined to a few Counties, but as there are

many other Places where it will succeed as well, we shall endeavour to make it universal.

The Hop is a tall weak Plant, that climbs by the Means of more substantial Things: naturally it runs up Hedges, and Art supplies it with Poles for this Purpose.

The Root consists of thick black Strings, the first Shoots are thick, soft, and tender, like those of Asparagus, and are eaten in the same Manner. The Stalks, as they rise higher, become rough and firm in their Substance. The Leaves are large and rough, and are divided like those of the Vine. And the Flowers and Fruit grow upon separate Plants. This is not singular to the Hop, for Hemp grows in the same Manner, as also Spinage, and many other Herbs less regarded. The Flowers are small, greenish, and trifling. The Fruit is what we call the Hop, for the Sake of which the Plant is raised.

The Flowers being not succeeded by any Fruit, are called Male Flowers, this being the customary Expression in treating of such Plants. Each consists of five, oblong, blunt, and hollow Leaves, within which stand five extremely short and fine Threads, each topped with a little Knob or Button.

The Fruit which grows in the Place of a Flower in the Female Hop, consists of a general Cover or Case, divided into four Parts. Each separate one consists of four Leaves, and is of an oval Figure, and contains eight Seeds, in their proper Receptacle; so that the whole Hop contains thirty-two Seeds. The Case in which each Seed is ripened, is of an oval Form, and made of one little Leaf, in which rises a little Button, terminated by a slender Filament, and divided into two spreading Threads. This

Button



Button becomes the Seed, which when ripe is roundish, covered with a Kind of Coat, and is lodged in the Bottom of the Case.

This is the exact Structure of the common Hop. Eight of these Seeds within Cases, are enclosed in each Division of the general Fruit, four of which make up the whole.

The Flowers of the Male Plant are not useless, as the Vulgar suppose. Though they produce no Fruit themselves, they are necessary to the ripening of the others. Every Fruit has its Rudiment in the Bottom of the Flower, and the Dust in the little Heads in the Middle impregnate it, otherwise it never ripens. In most Plants these little Heads are in the same Flower with the Rudiment of the Fruit or Seed, as in the Tulip and others: in some they grow in separate Flowers, upon the same Stalks; this we see in Melons and Cucumbers: and in some, the Flowers having these little Heads in them, grow on one Plant, and the Rudiment of the Fruit in another of the same Kind. This is the Case in Hops, and in Hemp, Spinage, &c. as we have said already. This is the Course of Nature in providing for the ripening of the Fruit of this useful Plant.

It does not appear by any thing in the Works of the Antients, that they were acquainted with the Hop. PLINY is the first who names it, and that only as a Sallad Herb. But we are not to wonder we read nothing of it before his Time. The GREEKS studied Utility; and the Use of the Hop in Malt Liquors, which is its great Service at this Time, was not known to them. They had Malt Drinks, but they were not made for keeping; Lupulus is the Name by which it is called by PLINY, and others; but it is become a Fashion lately, to call it Humulus.

The Hop is a wild Plant in ENGLAND, and most other Parts of EUROPE, and it naturally loves a damp Soil at the Foot of a Hill, we find it in such Places crawling up the Bushes in Hedges; but its Value occasions it to be cultivated with Care, in Grounds chosen for that Purpose. We shall proceed to give the practical Husbandman an Account of it.



## CHAP. II.

### *Of the several Kinds of Hops.*

TO speak with Strictness there is but one Kind of Hop; for what are mentioned under different Names, whether among the Writers on Herbs, or the Planters, are only Varieties of the same Plant, as Culture and other Accidents have changed it. However, as some of these keep their Difference in planting, we who write for Utility, not Curiosity, may very well distinguish them according to the Custom of others, into these several Sorts.

In Books we meet with an Account of the Male and the Female, of the wild and the Garden Hop. What is meant by the Male and Female we have shewn. As to the others, the Difference is only that made by proper Care, from the Plant in its natural Wildness.

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When we speak with the Planters, they tell us there are four Kinds of Hops. These are the best Directors for the Husbandman, and we shall therefore follow their Division. The four Kinds are these: 1. The wild Garlick Hop. 2. The long and square Garlick. 3. The long white. And 4. The oval. The first of these is what Authors call the wild Hop, the three others they confound together under the Name of cultivated Hops.

The wild Kind is poor, small, and not worth Notice. The long and square Garlick is a well tasted Hop. But 'tis ill-coloured, for which Reason it does not bring so good a Price; the Fault in this Respect is a Redness which it always has about the Stalk. The Long-white is the most beautiful Hop, and the most valuable, because of its greater Encrease, and the next to these are the Oval; these are shorter than the Long-white, but otherwise equal in Colour and Flavour.

It would be natural to say that none but the Long-white should be cultivated, because these are the best and most plentiful in the Produce, but 'tis not every Land that will bear them. They will live in any, but to thrive they require what is very good, and a thriving Crop of the long and square Garlick, is better than a starved one of the other.

Therefore let the Husbandman who shall think of raising Hops, suit the Kind to his Land. All Hops love a very mellow rich Soil, but the long Garlick being most of the Nature of the wild Hop, will bear a poorer Ground better than the others.

The proper Soil for a Hop Ground is a rich Garden Mould. But as this is never found entire, we are to tell the Farmer that of its two general Mixtures, which are Sand and Clay, the Clay makes it unfit for Hops; but the Sand, in a moderate Quantity, is not hurtful.

In order to plant Hops with any Prospect of Success, the Soil must be deep and well conditioned to the Bottom.

If the Ground on which the Husbandman intends to raise his Hops be pure and fine Mould, let him plant the Long-white, and no other Kind. If it have a moderate Mixture of Sand, let him plant the Long-white and Oval together, for they will do very well in the same Ground. If it be much inclined to Clay he is not to use it for this Purpose, but if only somewhat clayey, and he will have it a Hop Ground, he must plant the long Garlick. Before the Husbandman fixes upon his Design, let him not only examine the Condition and Depth of the Earth, but what is under it. The deepest Soil does not reach far, and in all Growths a great deal depends upon the Nature of the Bottom, but in none more than this. A Clay Bottom is too cold, and retains too much wet; and a gravelly Bottom lets it through too fast, so that they have not enough to nourish them, for the Hop being a tall Plant requires a good Quantity of Moisture. A loamy Bottom is the best. That Sort of Earth of which Bricks are made, is of a very fit Kind, and is a very common Bottom to the Soil in most Places. Let the upper Coat or Soil be light and rich, and it matters not for the Colour. The Essex Hop Grounds



are on a moory Land, which is black; and many of the KENTISH are upon a whitish crumbly Soil, they succeed equally well, all that is required being a Quantity of good Ground, wherein the Roots can run with Ease, and find a due Quantity of Nourishment.

### C H A P. III.

#### *Of the proper Land for a Hop Ground.*

WE have shewn, in a preceding Part of this Work, that Plants in general send their Roots deeper and farther in Search of Nourishment, than is commonly thought: none go deeper or farther than Hops; for this Reason, in preparing Land for them, if the upper Part be a great deal better than what is under it, as is generally the Case, the Work must be done in the Way of trenching, and the fine Part of the Soil buried undermost. What is at a Depth being much more essential to this Plant, than what is near the Surface.

When the Piece of Ground fixed upon for this Purpose is over moist, it must be laid up in high Ridges, to be well drained. And when it has been thus rightly managed at first, it must be kept in the same Condition, by keeping the Drains open and clear, otherwise the Roots will be destroyed in Winter.

We have observed that clayey Soils are to be avoided, and there are two others nearly as bad, these are, the gravelly and rocky. In neither of these Hops will ever answer, but in any others they may be raised; and if the worse Kinds be planted on the more indifferent Lands, and the finer reserved for the best, with due Care they will never fail.

Hops root so deep, and spread so far, and draw so large a Quantity of Nourishment, that they exhaust a Land extremely. They may therefore be planted after almost any other Growth, but no other will thrive after them except Trees, which root deeper, and spread farther than they.

For this Reason a Piece of Ground that has been exhausted by other Crops, which do not root deep, will raise Hops very well, though an entire new Piece of Ground does better; if any one should break up a Piece of Saintfoin for Hops, let the Soil be what it would, they would never prosper well, because that Grass having rooted as deep as they, had drained the Earth of its Nourishment so far as they can reach: but on the other hand, if a Piece of Corn Land that will no longer bear Crops without Refreshments, be turned up for a Hop Ground, it will succeed very well if the Soil be proper, because Corn roots superficially, and the Earth at that Depth which Hops reach is left unexhausted. But a Piece of Virgin Land is better than this, because in that the fine unexhausted Top of the Soil may be turned in under the other, and no Land can afford them such excellent Nourishment.

Therefore let the Planter observe that he take the best Ground he can find, if he have his

Choice; and knowing that it will be fit for Hops only a certain Time, and fit for no Crop afterwards, let him prepare accordingly.

Saintfoin, which roots deep, leaves Land in a very good Condition for Corn, because it spreads very few Fibres near the Surface; but on the contrary, the Hop spreads its Roots deep and superficially too, so that 'tis fit for nothing afterwards but Trees.

A good Piece of Land reduced from common Tillage, will support Hops very well eight Years: a Piece of Virgin Earth, if the Soil and every other Circumstance be favourable, will support Hops twelve Years; but not longer to Advantage. Let the Planter take the proper Care therefore in Time.

When he has laid his Design for a Hop Ground, let him plant it also with Apple and Cherry Trees at the same Time.

These will draw but little Nourishment while young, and therefore the Hops will very well stand twelve Years with Advantage. At the End of this Time the right Practice is to make a new Hop Ground in another Place. By this Time the Cherry Trees will bear. They will continue improving every Year for some time, and will last very well five and twenty Years; at the End of this Time they may be cut down, and the Apple Trees will be in fine Order.

Let it be remembered that the Hop, in its wild State, loves a sheltered Place, at the Foot of a Hill; and let the Planter chuse his Spot accordingly, for Nature is an excellent Guide. A Piece of Ground that lies low and warm, open to the South, and well defended by Trees on the other Quarters, is the favourable Spot for Hops; if the Soil be deep and good in such a Piece of Ground, no Way of employing it can turn to so great Account. If such a Sheltering is wanted naturally, it must be raised by Art, and there must be Water near. These are the Requisites.

### C H A P. IV.

#### *Of placing the Hills.*

WHEN a Piece of Ground is fixed upon, which has all these Requisites, and a proper Quantity of Plants of a Kind suited to its Nature, are in Readiness to be taken up occasionally for it, the Ground is to be prepared for their Reception.

Hops are planted on so many little Hills, and these are to be placed at such Distances as are best suited to the Extent of the Ground, and the intended Manner of dressing.

If the Piece be small, the Breast Plow or Spade must be used for dressing the Ground, when the Hops are upon it: but it is much better to set out with a larger Piece, and dispose the Plantation for Horseshoeing.

Whichever Method be taken, Time and Pains are required to put the Ground in proper Order. OCTOBER is the Season for planting the Hops, but the preparing the Ground is the Business of a Month before. The first Thing that must be done is plowing it up, and laying it very even.

The





*Hops*



*Garden Flax*



*Male, or Steel Hemp*



*Female Hemp*



*Hoad*



*Common Wood, or Deers need*



*The Coleseed Plant*



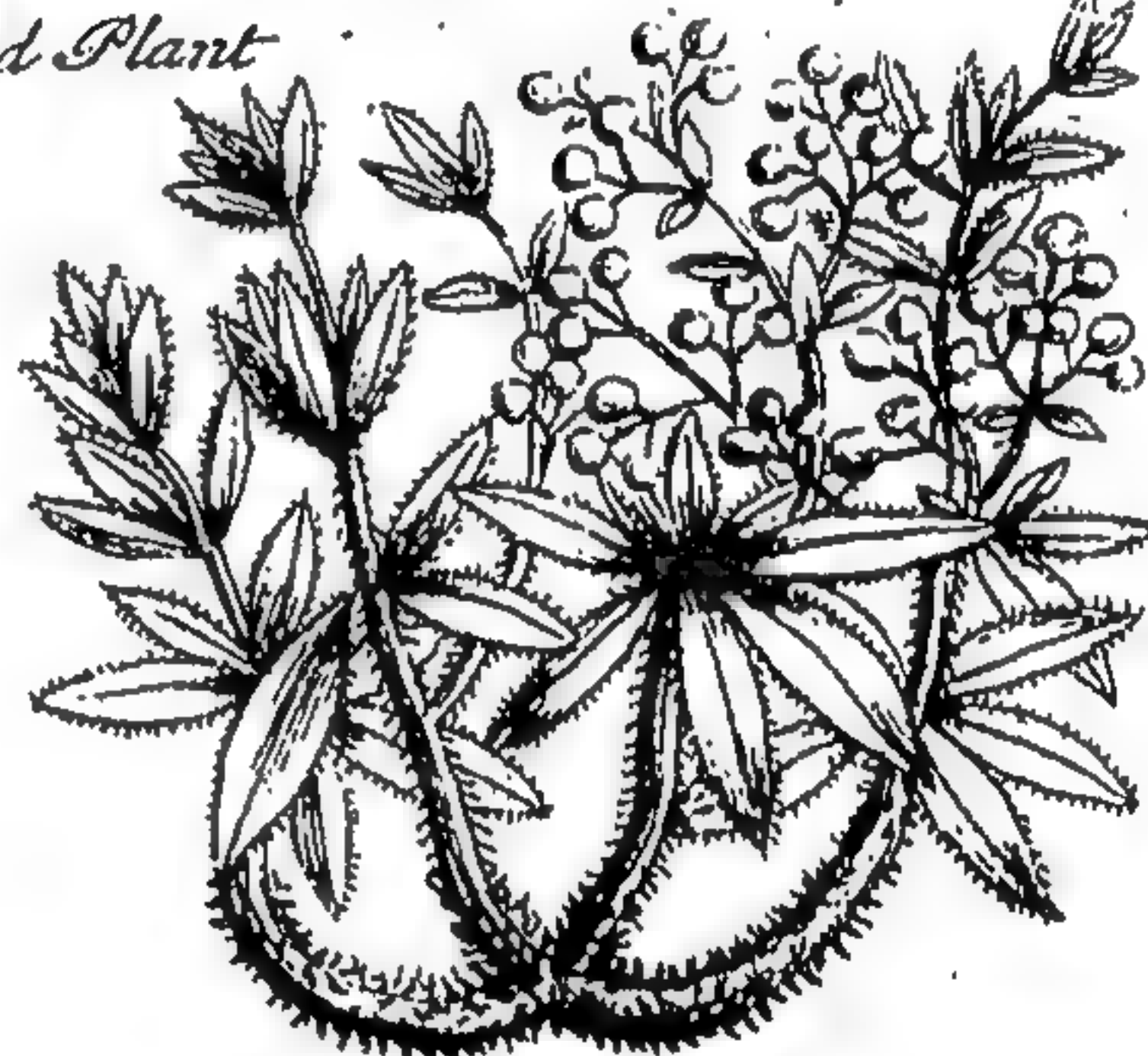
*Common Squorice*



*The Saffron Plant*



*Bastard Saffron*



*Bladder*



*Garden Cress*



*Anise*



*Caraway*



The Spade may answer this Purpose in a small Piece of Ground, but larger are in all Respects better.

The Intent of this plowing or digging is to break the Ground very small, and to a considerable Depth. The proper Plow therefore is the four coultered one, described before, set to its greatest Pitch; in this Condition, with the Guidance of a skilful Plowman, it will cut two Spit deep, and tear the Ground all to Pieces the whole Way. When the Ground is thoroughly broke and divided by this Plow, let a Harrow be drawn over it; and last of all a light Roller. It will then be well broke, and will have an even Surface: this is the Condition wherein it is fit for laying out for the designed Plantation.

The next Thing is to determine what shall be the Distance of the Hills, and when this is settled a long Line is to be procured, and a Knot is to be tied in it by Measure, at every Distance that is settled for a Hill.

As to the Form that must be determined by the Ground, if that be small, and the Spade or Breast Plow are to be used, then the best Method is the Quincunx, which disposes the Hills in Lines, and leaves regular Alleys every Way between them, but in larger Grounds 'tis best in Squares.

The Line is to be drawn strait across the Ground, from Place to Place, according to the determined Distance, and a Stick is to be fixed down at every Knot. This marks the placing of the Hills.

When the Soil is thus turned and mixed together, the Planter will be better able to judge of it than before; and if it want Richness let him amend that Fault, by adding some good Stuff to the Places which are marked for the Hills; these being the Spots where the Plants are to be set.

It is very rarely that a Piece of Ground is so perfectly good, as not to admit of this Improvement, and as it is very great, and of no vast Expence or Difficulty, 'tis always worth while to do it.

We shall therefore advise the Husbandman in general, to plant his Hops in a Compost, and the best Method of making it is this. Dig a Quantity of rich Virgin Mould, or other very good and fine Earth, proportioned to the Number of Hills that are to be raised; add to this one fourth Part the Quantity of very old and well rotted Dung, and about a tenth Part of sharp Sand, let all this be well mixed and stand in Readiness. Then at every Stick open a Hole two Foot deep, and a Foot and half square, fill this with the Compost, and all is ready for the Plantation, which will thrive vastly the better for this previous Care.

We have not yet laid down any exact Direction for the Distance at which these Holes are to be opened, and indeed the Distance of the Hills is one of the nicest Things in the whole Business. Neither can any general Rule be given about it: for the Nature of the Soil, and Extent of the Ground, and intended Manner of working, will make Variations. In general about eight Foot Distance is the nearest they should stand.

As we have ordered the Farmer to sow more

Seed upon his poor Land, than upon that which is rich, so in the planting the Hop Ground we shall follow the same Method, and advise him if the Soil be worse than ordinary, to make his Hills at seven Foot Distance, and if it be very rich and fine to set them at nine Foot. If it be at any time found either in a new Ground or an old one, that it will nourish more Hops than there are upon it, the best Way is to add to the Number of Plants upon each Hill, and not to multiply the Hills. So that for this Reason the Planter need not be afraid he shall place them too distant.

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## CHAP. V.

### *Of planting the Hops.*

THE Hills being thus prepared, are to be planted; and Care must be taken in the providing such Sets as are excellent in their Kind. Let the Husbandman trust no Eye but his own for the Choice, and let him observe the following Cautions.

First let him consider the Kind, and next the Place where they have grown, for this is very essential. We have already said what Kind suits each Soil, and let him take Care to follow that Direction first.

Next let him consider the Soil from whence he has them; here there are two essential Points, which in a Manner contradict one another. 'Tis necessary he should have the strongest and most flourishing Sets he can procure, and 'tis best that he have them from a poorer Ground than his own. Let him be sure they do not come from a richer Soil, for then they will certainly dwindle: but let him chuse the strongest Shoots of a middling Piece of Ground; for his Compost into which they are to be set will certainly exceed that in Richness, so that they will be forwarded for the first Shoot; and the whole Ground being newly stirred, they will spread their Roots without Difficulty, when they have shot them beyond its Extent.

When the Planter goes into a Ground for purchasing his Sets, let him, after he has considered the Soil, examine the Height of the Hills. Nothing so strengthens the Shoot of the Hop, as the raising the Hill high. Let him therefore chuse them from such Hills as have been most raised the preceding Year, and from such as are fullest of Shoots; because this also is a Sign that the Roots whence they come are hearty; and where there are most of them, they are always, while thus young, the most vigorous.

Having fixed upon the Hills let him fix upon the largest Sets, and see them taken carefully up, they should be about ten Inches long, and have four Joints or Buds. When a proper Quantity are taken up, according to the Number of Hills there are to be, let them be laid in the Ground in a cold and damp Place, and taken out as the Holes are prepared for their Reception.

In the Center of every Hole that has been filled up with the Compost, let there be a square Opening made of a Foot deep, throwing up the



the Earth on the Sides. Into this Hole, which must be the full Foot deep, put four of the Sets. Place one at each Corner. Set them upright, with the Top just level with the Surface of the Ground, and then throw in the Earth that had been dug out, fixing it well about the Roots. Cover the Tops about two Inches with the finest and lightest of the Mould, and the Hole is finished. Thus the Foundation of one Hill is laid.

In the same Manner plant four Sets in each Hole, covering their Tops, and burying the whole Set strait, and closing the Mould about the Roots.

About a thousand Hills will very well stand in an Acre of Ground, supposing it of the middling Kind, and this is the whole Trouble of planting them. The Expence is not great, for the Sets are sold cheap enough, and an expert Person makes quick Work in setting them.

The Husbandman sees the Ease with which Hops are raised, we shall now tell him the Encouragement he has to plant them. No Produce whatsoever is equal to them: they may reasonably be expected to yield fifty Pound an Acre, and sometimes in favourable Seasons, when the Soil and Situation are right, an Hundred.

These Things considered, nothing is more surprising than that Hops are not propagated universally: at present the Planter need not be afraid of over-stocking the Market. The Demand is greater by much than the Supply, and we annually import a vast Quantity of them from FLANDERS, though vastly inferior to our own. No Country so much favours their Growth as ENGLAND; nor is there any County throughout the Kingdom where they may not be raised to this certain and vast Profit, and with this perfect Ease.

These are the common Rules observed in putting the Sets into the Ground; but as this is an Article of the greatest Consequence, the whole future Advantage depending upon it, we shall enlarge upon the Particulars to be considered respecting it.

Let the Planter see that his Holes are open and perfectly prepared, before the Sets that are to go into them are taken out of the Ground, for the best Care that can be taken of them is the clapping them quickly into their Places, nothing prejudicing them so much as keeping them long out of the Earth.

In the taking them up the greatest Caution is to be used, not to bruise the Roots; and whatsoever Parts of them may happen to be so injured, must be cut off beyond, that is, above the bruised Part, for this always decays; whereas, when the Roots are cut off clean, they not only are so many Mouths themselves, but every one of them shoots out several small Roots; which does not happen if they be crushed and injured. These Parts grow presently mouldy, and the Infection spreads from them to the rest of the Plant: every Fibre that runs near one of these mouldy ones is sure to be tainted. Not only the Fibres are to be cut off at the Ends, and the injured Roots to be cut away, but if there be any Roots that run crosswise of one another, or any that spread with a Tendency upward, the

first are to be cut quite off, and the others are to be shortened almost to the Set. The cross Roots, if too near, will press and injure one another; and the Hop is to root deep in the Ground, therefore the others struggle in a wrong Manner.

As to the Depth of the Holes made for receiving the Plants, what we have given is a general Rule, but it may admit of Exceptions; and we are in this Article to accommodate ourselves to the Condition of the Ground. If that be rich, free, and fine, we may plant the deeper, but if it have a bad Bottom we must go the shallower in the first setting, leaving the Plants to push afterwards.

When the Hole is dug and the Plants are ready, let the Planter observe that he set them so, that as near as may be they may stand covered just as far as the Point or Head; and when the Hole is square, four are to be placed at the Corners; and if one more be added, it must be just in the Center; if two more, in a Line going across the Middle, and at equal Distances from all the other.

When the Sets are in the Hole let the Compost that is to fill it up be broke very fine with a Spade, and thrown in a little at a Time; and in this Manner it will fall all round them, and about each Set, leaving no Hollows. When a little is thrown in it is to be settled about them with the Hand, and when all is in it is to be gently pressed with the Feet, but not too hard: the Intent is, that it may every where fall close about them, and yet it is not to cake about their Stems.

Some who plant in Spring, if the Season be dry, water their young Sets, but this is altogether wrong. The Depth at which they are planted is such, that the Earth will always have Dampness enough to support them, and it is a Season when there must come Rains sooner or later upon them.

We have recommended the planting at Autumn, and then there is not the least Hazard of wanting Water, nor the least Occasion for giving it to them; on the contrary, when People over careful of their new Plantations, will be at the Labour and Expence of doing this, they only injure the Plants; for the Wet, especially if it be too much, rots the Roots. We have observed that the Root of the Hop is very liable to Accidents, it will grow mouldy if bruised, or on any other slight Injury, and nothing will contribute more to that Accident than too much Wet, so that the over Care often is destructive.

There are People who, instead of opening the whole Hole, and setting in the Plants regularly by Hand, place them in the new made Ground with a setting Stick, closing the Earth about them as Gardeners do in the common Way of planting Roots, but this is a very slight and inconsiderate Method: the Hop Plantation is an Undertaking of great Consequence, and 'tis worth while always to set about it with Care, and all possible Advantage of the Ground: the Success of the first Year will over-pay any extraordinary or particular Expence on that Head.

When the Planter has thus got all his Sets into the Ground, let him leave them to Nature for



for their Growth; and the next Summer let him watch them in their Fruiting, some will rise worse than others, but at the same time he will find some better than the common Run; in this Case he is to mark the Hills of both Kinds, the worst to take away, and the better to propagate. For this Purpose let him take particular Care of those Hills on which the fine ones grow; and the next Year, when the Time of tying is come, the superfluous Shoots on these fine Hills are to be reserved for laying. When the others are tied up these are to be cut off at the Top, and laid all the rest of their Length, burying them in the Ground; in this Condition they will each send up a great Number of strong and healthy Sets, which in the succeeding Autumn may be planted out into Places where the Hops were worse than the common Run; in this Way every Year the Hop Ground will be improving, and by proper Management in Dressing, and due Tendence, will exceed that of any other.

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#### CHAP. VI.

##### *Of dressing and managing a Hop Ground.*

WE have shewn how to prepare the Land and plant the Hops; but if we were to stop here, the Husbandman who should be led to plant, and left without farther Instructions, would be bound to curse us for deceiving him; so it would really prove, should he be left in the Dark, for the Management of his Plantation. The Profit from the Hop is very certain, though it vary greatly, according to the Seasons and Accidents; but this certainly supposes a due Knowledge and Care in the dressing of the Ground, for it will be six Times as great from a Ground well, as from one ill managed. He is not to look for this Information among the Planters themselves, for they know very little, and that little they keep very secret. Half their Plantations come to little, from want of Care or want of Judgment; and from what I have seen I shall freely add, that the very best of them do not yield half their natural Produce.

There is not any Hop Ground I have seen but might double the Owner's Profits, with a more judicious and diligent Management: we shall lay down the whole Method, and it will be found not at all difficult or perplexed, only when so familiar a Practice is rightly understood, let it be carefully followed and observed in every Article. Let not any be afraid of the Expence of managing a Hop Ground, for it is really very moderate; nor let him be terrified at the Plantation being liable to Accidents; for though it is more so than any other Growth whatsoever, yet with due Care one half of them may be prevented, and the greatest Mischief of the other remedied. Of this we shall treat at large in a succeeding Chapter, not to break in upon the Thread of the Subject here.

The first dressing of the Hop Ground depends upon two Principles, the Earth is to be broken and divided that the Roots may find an easy Passage; and the Weeds are to be destroyed as

they rise, that they may not rob the Plants of their Nourishment. There is no Way of doing this so proper as by the Horsehoeing, because that at the same Time as it destroys the Weeds, breaks the Ground thoroughly between the Hills; and the Hops soon spread beyond them into the Ground.

The young Plants will now have the Winter for fixing themselves in the Earth, they will shoot out fresh Roots before the Cold reaches the Depths at which they are planted; and these will strengthen themselves well in the Ground before Spring, that they will then shoot vigorously both in Roots and Tops.

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#### CHAP. VII.

##### *Of polling the Hops.*

THE Poles are now to be provided, for the sooner they are fixed the better, that the Roots may not be disturbed in their new Shoots by them.

Three, four, or five Poles must be allowed for each Hill: the Difference is according to the Distance of the Hills; if these be at seven Foot three Poles will do for each, if at eight Foot four, and if the Ground be very rich, and the Distance of the Hills nine Foot, there should be five Poles to each. In general the poorer the Land the nearer the Poles may be placed, for where that is rich, and the Growth is luxuriant, they must be at a greater Distance.

In the same Manner the Bigness and Length of the Poles is to be proportioned to the Condition of the Ground, and the Growth of the Hops. In moderate Ground Poles of a moderate Size will do, but in rich Earth, where the Hills are distant and the Growth strong, the Poles must be large, stout, and very tall, otherwise a great Part of the Profit may be lost from this Deficiency.

The Growth of the Stem of the Hop will be in a great Measure determined by the Length and Bigness of the Pole; if that be tall the Stalk will run up, and if the Ground be but poor when this happens, the whole Nourishment will be exhausted on the Stem and Leaves which should go to the Hops, so that they will make but a poor Progress. This is the Caution necessary against over-polling the Ground, than which there is no Error more destructive. On the contrary, when the Earth is rich and able to support the Plants, and when the Hills are placed at such a Distance that there is Space for the Roots wandering for Nourishment, and that is provided in Abundance by the dressing of the Ground between, in that Case we can get no Poles too long; for there are none so high but the Stem of the Hop can get to their Top, and flourish over it, and yet have Strength at the Root for nourishing and filling the Fruit, which will be the more numerous in proportion as the Plant is larger and spreads more.

We are now speaking particularly of the first Year of a Hop Ground, and in this some particular Caution is necessary. If the Ground be but indifferent, let the Poles be very short this first



Year, for nothing is so dangerous as the carrying up the Plants too much in Height the first Season in such Ground: where they have no Abundance of Nourishment, and have not been able since their planting to search thoroughly for what there is. If they be led into a Habit of running too much into Stem this first Year, the Fruit will be small, and perhaps the Fault may never be recovered.

Even in the best Grounds where soon after no Poles can be too long, it is a very good Caution to use such as are shorter the first Year, not tempting the Plants to run up too high, but encouraging them into Fruit. They will be ready enough to take the Advantage of the longest Poles afterwards, and fill the whole Length with Fruit.

An Acre of Hop Ground will require between three and four thousand Poles. Let these be got ready, and early in Spring laid in upon the Ground between the Hills, to be in readiness. Fifteen Foot is a moderate Length. The largest Poles which are fit for the richest Ground and best Hops, should be twenty Foot long, and seven Inches round, but these are too large for any Ground or any Condition of the Hops the first Year; so that somewhat smaller are better in all Kinds in the Beginning.

Alder Poles are very proper, they are strait and run high; Ash also are excellent, because of their Toughness, and there are some other Woods that do well enough. They should be cut with a Fork at the Top, for it serves to give a Support to the Head of the Plant, and is of the greatest Service.

The Time of polling is one of those Circumstances that require the greatest Care in the Management of a Hop Ground, it must not be done before the Shoots appear above Ground, because the Plants may be injured by it, and the proper Place cannot be known; and on the other hand, if it be deferred long after they have shot, the Plants will be checked, for the Hop stops presently in its free Shoot, if it have not a Support to climb upon. This Work is to be begun after the Shoots appear, and must be finished before they are any where three Foot high, and this in a large Ground is a sharp Business, for the Hop grows very quick in its first Shoot. The Poles are to be fixed near each Hill, three, four, or five to each, according to the Rule before laid down, and they are to be fixed in Depth according to their Height, and to the Condition and Exposure of the Ground. The richer the Ground the deeper they must go, and the more they are exposed the firmer they must be placed; indeed we have observed that a Hop Ground never is to be in an exposed Situation, so that the Danger there ought not to be great.

Let the Planter consider that nothing is so destructive as the rising of a Pole out of the Ground: the breaking of one, though a troublesome Accident, is not near so bad, on this Principle let him work, fixing them in the Grounds so firm, that if such Violence is offered they will sooner break than rise.

There is a great deal in the fixing them, not only in Point of Strength but Position, they must

always be placed so as to lean a little outward, though not much. It is natural to plant them a little slanting inwards, and ever so little of this is wrong. The Hop, more than any Plant whatsoever, requires a free Air to pass all round it, and this is prevented by the Poles bending inwards. Most of those Disorders of Hops, which are so injurious to the Planter as we have shewn before, arise from the Want of a free Passage of Air, this we shall explain at large in its Place. The naming it here may be sufficient to give the Planter a Caution not to let his Poles slant inward; if this be ever so little, the Weight of the Hops will soon make it more, and they will close in at the Top like a Canopy over the Hill, the Consequence of this is a certain Taint in the Hops.

To prevent this it is that we order the Poles to be fixed slanting a little outwards; but let Moderation govern here, if they slant too much the Weight of the Hop will lean them down the other Way, which is also wrong. The Business is to keep them as upright as possible. Therefore let the Planter observe how the Tops of the Poles stand when he has fixed them; if they are a very little more distant at the Top than at the Bottom they are right, not otherwise.

Another Caution is, that they are made to lean a little toward the South. This is very essential, for it gives the Sun Opportunity to shine in among them; which is of the utmost Consequence. Hops perspire a great deal, and that damp Vapour is apt to hang amongst them. This taints them, and is the Origin of many of their Disorders. The Sun shining freely in at the same Time, dispels this and warms the Plants, it keeps them from Damage, and assists the Growth and ripening of the Fruit. This leaning however must be but moderate, as the other, for if great it prevents the very Intent wherewith it is done, for the Plants will obscure one another, and the Sun cannot get in.

We have observed at first, that great Care is needful in the Management of a Hop Ground, it will be seen in this Article the strictest Nicety is required in this Inclination of the Poles. It is confirmed by repeated Experience, that a Pole which leans a little will bear one third more Hops, than one under all the same Advantages in other Respects, that stands upright: but of this I can assure the Planter, from my own Experience also, that a Pole which leans too much will yield fewer Hops by one third than one which stands perpendicular: and beside the Defect in its own bearing, will hinder that of others.

There is also another very substantial Reason against the too great leaning of an Hop Pole, that is, the Danger of its breaking, which is a bad Accident, or of its tearing up, which is a still worse, when the Weight of the Hop bears upon it.



## C H A P. VIII.

*Of inspecting the polling.*

**A**N Accident in the polling of Hops, if a careful Eye be kept over them, and it be seen in Time, is easily remedied; and there ought to be such an Eye continually upon the Ground, to insure the full Profits.

First, if upon the shooting of the Hop at six or seven Foot high, it be seen to be over-poll'd, that is, if the Pole be so tall that it will be apt to carry it up in Length, and prevent its fruiting well, it may be unwound from the Pole, that may be taken up, and another may be set in its Place, and the Hop brought carefully round it, and it will take to it as naturally as to the first. In the same Manner if it be seen, from the free growing and promising Aspect of a Plant, that it is under-poll'd, or that it will bear a taller and stouter, it may be unwound, and such a one set in the Place of the other.

In the second Place let the Planter go through his Ground, and inspect carefully the Condition of all his Poles, as to their Firmness in the Earth; let him be particularly careful in this Respect, in Places where the Wind has most Power. When he sees any in Danger let him order a Man with a Rammer to force down the Mould, on the Side of the Pole opposite to the Wind, which will enable it to resist the Efforts.

Thirdly, let him take Care to have spare Poles of different Sizes, not only for the replacing such as are too small or too large for their Plants, but for the supplying the Place of such as shall break, for this is an Accident that will happen; and it must speedily be remedied. A Hop Plant that is suffered to lie upon the Ground, will yield very little.

Fourthly, let him be ready not only to remedy such Accidents, but to prevent them. He will see where a Pole is over-burthened and in Danger of breaking, and let him not stay for the Accident, but place in a spare Pole to support the other.

And finally, where he has not perceived in Time, that a Hop was under-poll'd, but sees it requires a taller Pole, when it is too late to unwind it, let him place a square Pole near the other, and trim the Hop to it, that it may have a fresh Support, and Room to spread to the greatest Advantage.

## C H A P. IX.

*Of the tying of Hops.*

**T**HIE Husbandman who shall have a Design of entering on the Hop Branch, though ever so unacquainted with it before, and ever so much out of the Way of Instruction from those who practise it, will find here sufficient Directions under every Article; and provided he will observe carefully the several Directions, and keep a con-

stant Eye upon his Ground, we will venture to assure him of Success.

He has seen how he is to prepare his Ground, plant his Sets, and fix his Poles. The next Article is the fixing the Plants to these Poles, this is done by tying.

According to our Directions of not setting in the Poles till the first Shoots appear, it will be time to begin tying by that Time they are all well in the Ground. For the proper Time to begin to lead the Plant is at about a Yard high.

Let the Ground be now carefully looked over; let it be considered what each Pole may bear, and so the Plants proportioned to them. This done let each Shoot be led to the proper Pole, which is usually the nearest, and let it be wound once or twice about it, in a Direction according to the Course of the Sun, for the Heat naturally draws the Shoot that Way, and the Course of Nature is not to be perverted.

When it is thus fixed to the Pole it is to be tied round, to keep it there. Any soft Matter does for this Purpose, a Piece of Bafs or withered Rush, or a Fragment of Yarn. Care must be taken that the Stalks of the Hop be not hurt in the tying. Let them be tied in two or three Places, but let a great deal of Caution be used in doing it, that they are not press'd, for the young Shoots are tender, and the damaging of them will be of very bad Consequence. The Heat of the Day is the best Time for the doing this, for in the Morning, being full of Juice, they are brittle: The Heat of the Sun evaporates some of it, and they are then more firm or will better bear a Touch.

After this there must be no more tying, but the Plants will still require a great deal of guiding, to keep them properly to the Poles. We shall be now advanced to the second Stage of Growth, and our Hops which have been tied some little Time, will continue shooting very quick; and in general, if they have been carefully wound and tied, they will follow the Course intended round the Pole, very freely and favourably. But there will have been less Care taken of some, for no Work is ever done throughout with perfect Regularity, and there will be some Plants very luxuriant and very cross-grained, that will ramble from their Poles, and hang wild and drooping; these must be set right with the Hand, for the first Week or ten Days: toward the End of APRIL the Planter must himself go over his whole Ground again, and see what farther is amiss in the same Way: something will still be amiss; and no Hand is so fit to rectify it as his own. No one's Interest is so much concerned, and therefore no one will be so careful; the Tops which straggle from their Poles, will now be above the Reach of his Hand; he must therefore take a forked Stick, of five or six Foot long, and with this he must turn and direct them properly to the Poles, which they will readily enough take to when once put round, though they had straggled naturally ever so much from them.

A Fortnight after this, that is, toward the Middle of MAY let him go round once again, with the same Design. His Workmen must have



have general Orders to rectify what is casually amiss, from Day to Day; but these are the Periods whereat he should go through the whole himself; and they return so quick, that if it be a considerable Ground they will allow him little Respite. When we advise this compleat Attendance to be given by himself, we suppose the Ground to be but of a moderate Extent, and the Planter not very much pressed by other Affairs. When the Ground is larger, and the Owner has Affairs that will not permit himself to attend, he must depute some careful and faithful Person; and still follow at Times with his Eye, what he does not execute with his Hand.

At this Inspection in MAY, whether by himself or a Servant, the greatest Care of all is required for two Reasons; first, because it will be the last Time of going over the Ground; and secondly, because Faults at this Time are of worse Consequence than at any other.

On this last View he will find several that have straggled from their Poles, or that grow crossly since his last reducing of them. They are very strong at this Season, and the least Fault encreases to a very great one presently, therefore let him go over them now with redoubled Care. Neither his Hand nor the Stick will now reach them, for they are by this Time grown to a very considerable Height; whoever does the Business must be followed by a Labourer with a Ladder, with a Back to it, and this must be set down against every Pole where there is any thing amiss: every Fault is to be thoroughly rectified, and they are then to be left to themselves for a Month.



## C H A P. X.

### *Of clearing the Ground and raising the Hills.*

**T**HIS is a very considerable Article in the Care of a Hop Ground, which too many practise too slightly, and which the best Managers I have seen do not go through with sufficient Diligence and Attention; let the Husbandman who plants upon our Plan regard it more perfectly.

We left the Hops in the last Chapter at a good Growth, toward the latter End of MAY, directed rightly in their Course along the Poles, and prepared for a beneficial Crop. We are now to proceed to the next Operation, which is that of shortening the Plants, but as it is a Month before that is to be performed, it will be proper to consider the Condition of the Ground, and the Work that is to be done in the mean Time below.

We have said the Earth is to be stirred from time to time between the Hills, and the Weeds are to be destroyed as they rise; this is a general Direction, but we are to come to Particulars in this Place. We have frequently spoken of the Hills in the Hop Ground, but that Name is given to them in Consideration of what they are to be, rather than what they are in so young a State of the Plantation as that we have hitherto described; they as yet rise only two or three

Inches above the Level of the rest, and are only of a small Diameter. We see them larger in old Grounds, and we are about to enlarge them in our new one.

Holes were dug for the planting the Hops, these were filled with Compost for the Reception of their Roots, four of the Sets were planted at the four Corners of each Hole, and the Earth was raised two Inches very lightly over their Tops, which were on a Level with the Surface; therefore the Spots where they now stand are a little raised, and the level Ground between is plain, as the Harrow left it.

In this Condition we see it in the Beginning of JUNE, and we then are to begin to give it more the Form and Appearance of a Hop Ground. After the first Shower let a Number of Labourers be sent into the Ground, with an Overseer of the Work; he is to set them to pare off the Surface of the Earth between the Hills, about two Inches deep, himself is in the mean Time to be at work at the Hills. He is with a careful Hand to cut away all the superfluous Shoots of Hops, and thoroughly to destroy all the Weeds that rise upon the Hills; this Earth which the Labourers pare from the Surface, is then to be shovelled to the adjoining Hills, and carefully laid upon them. In this Manner they will be encreased both in Height and Breadth, and the Ground will have more Appearance of what it really is.

We mention the Spade for this Purpose, because it will suit a moderately large Ground. In a very small one the Handhoe will do; and in a larger the Horsehoe, or Hoe Plow, invented for the Service of the new Husbandry, is best of all. It is much the best Method to set out with a large Piece of Ground at once, and to prepare it for this Instrument by the Disposition of the Hills as we have directed; there is no Article in which it is more largely serviceable; nor will any Hop Ground succeed so well nearly, as one that is so managed.

Whichever Method be taken, whether that by the Spade, Handhoe, or Hoe Plow, it is to be conducted in the same Manner, the Hills are to be raised, with the Earth thrown up, and the Weeds destroyed.

This is to be repeated once in three Weeks, during the whole Summer, exactly in the same Manner, always taking the Advantage of some Rains, for the Earth cuts better, and every thing is more compleatly done at such a Season. This perfectly kills all Weeds, and the Earth added from time to time, keeps the Hills moist, and gives Nourishment to such new Roots as shoot from the upper Part of the Set.



## C H A P. XI.

### *Of shortening the Hop Plant.*

**T**HIS is a Practice much more essential to the Success of the Plantation than many imagine. It depends upon the plain and certain Principle in Vegetation, that in order to promote a Plant's bearing a great Quantity of Fruit,



it is not to be suffered to spread too much out into Leaves, or to rise too much in Height.

We left our Hops at the End of MAY conducted properly along their Poles, and in a Way to take the succeeding Part of their Growth to the best Advantage.

In this Condition they are to be left to Nature for a full Month, they will be growing in Length all that Time, but at the Period of it they should begin to branch. Many of them will do so naturally, but such as do not, must be put into the Way of it by Art, and this is to be done by shortening the Stalk; that is, by taking off the Top Shoot.

Some prevent the shooting farther of the Stem in Length at this Time by turning it from the Pole, and this sometimes answers very well, but it is not so certain or so speedy a Way as the other.

According to the Directions we have laid down already for the proportioning the Poles to the Plants, we have given a Rule nearly how far in Length each Plant may commodiously be allowed to rise. The Ladder with its Stay is now to be brought into the Ground again, and set against every Hill; such Plants as have begun to spread, are to be left to Nature; for the Branches which are shooting out from them will draw the Nourishment, and there will not be any abundant Quantity sent into the Top Shoot. But where it is seen that Nature pushes all her Store this Way, and there is no Appearance of Branches, the Bud or Top of the Shoot is to be pinched off; and this stopping its Progress that Way, will give all the Sap to new Shoots and Branches. The more of these the better; and as they seldom grow much till toward the End of JUNE, they are then prevented from being luxuriant by the great Quantity of Sap that is devoted to the Nourishment of the Fruit.

This is a very happy Provision of Nature in favour of the Planter, but he must favour it, and pursue the same Course; otherwise Accidents will interfere and prevent much of the Advantage. Nature ordains that about Midsummer, the Hop Plant shall cease shooting at length, and begin to branch; and if a rainy Season, or any other Accident tend to interrupt her Course, and continue its Growth in length, he is to stop it by pinching off the Bud. In the same Manner Nature intends that these Branches shall grow but to a moderate Length, and then fill themselves with Fruit; but sometimes a luxuriant Soil, or a cross Accident of one Kind or other, will prevent this Purpose by the shooting of these Branches into too great a Length. In this Case the Planter is to treat them just as the main Plant. He is to nip off their end Buds; and as the Season is by this Time far advanced toward the fruiting, Nature will now follow her own Course, and turn all her Treasures thither.

A Plant that would have run thus into a useless Stem, or when there were Branches formed, would have extended them to a great Length, at the Expence of what was to be of Value, will by this prudent Management be thrown into a proper Course, its Stem shortened, and the Branches stopped in their Growth

Numb. XI.

till every Part be full of Buds for Fruit: this is its full Perfection.

The Planter is now only to observe their ripening, in this he is to wait the Course of Nature, he can do nothing to assist her, and he is only to watch that he may take the most favourable Opportunity for gathering those Fruits, the free Growth of which he has promoted by his Industry and Care.

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## CHAP. XII.

### *Of the gathering of Hops.*

IT is not without Reason we have said, the Planter is to watch his Opportunity of gathering Hops when they are ripe. Care and Attention has been directed throughout every Step of his Business, and there is no Part in which it can be omitted without Loss, but there is none wherein the Damage of the smallest Neglect will be so great as here.

The Hops begin to flower about the last Week in JULY: in a Fortnight after the first Appearance of the Flower, the Fruit begins to form itself for Perfection. This is, in the Phrase of the Planters, called the belling of the Hop, and it is to be expected in the Beginning of AUGUST: from this Time three Weeks, in a good Season, compleatly ripens them. So that the Planter may expect them in condition to gather in very favourable Seasons, in the End of AUGUST; in middling Times, in the Beginning of SEPTEMBER; and in the worst, soon after the Middle of that Month.

It is needful the Owner watch carefully for this ripening, let him begin the last Week in AUGUST to examine them daily, and so continue till he find them ripe.

The Marks of their Ripeness are these. First they change Colour, this is a sure Token that their Maturity is coming on: after this they begin to smell fragrant and sweet; in a few Days after the Seeds upon Examination will be found turned brown; and soon after this the Hop will easily fall to Pieces.

These are the four Stages of the Hops ripening; in the first and second that Period is coming on; in the third, it is perfect; that is, when the Hop has changed Colour, the Smell is strong, and the Seeds are brown, it is perfectly ripe; in the fourth Stage it is beginning to fade, for this is the Course of Nature: when Things have attained Perfection, the next Step is Decay.

The Progress from Perfection to Decay in the Hop is very quick, 'tis therefore we have recommended so particular and watchful a Care over it at this Season. When the Owner perceives them to have all the Signs of Ripeness, let him get together all the Hands he can for a quick gathering. One Day hanging upon the Plant after they are fully ripe hurts them, and if there should happen a windy Night, as is not uncommon at that Season, he may receive vast Damage.

There are too many who gather their Hops irregularly, and by that suffer a great deal of Loss.



Lofs. The most usual Manner of doing it is this. Begin in the Centre of the Ground: Cut down four Hills that stand together, cut the Roots even with the Ground, then lay the four Hills, and the Ground that is between them all level, in the Manner of a Floor: water this, beat it with a Mall, such as they use in Turfing, then sweep it and roll it with a heavy Roller.

This will be a fine level Floor, and is to be the Place on which to pick the Hops. To this Place they are to be brought from all Parts of the Ground, if it be a small one, all being at equal Distance from it; but in very large Grounds, another or several others according to the Extent, are to be made in different Places, but always central to some large Quantity of the Ground, for the Convenience of bringing the Hops from every Part to it.

The Hops to be picked are laid on this Floor, and the Pickers are to sit all round it, and to pick them into Baskets; the Floor is to be cleaned and swept once in three or four Hours, and this Way the Work is continued till all is finished.

The Method in which the Hops are to be taken up is this. First, let the Person employed in this Article, go round those he is about to raise, with a long Pole in his Hand, with a sharp Hook at the End of it: let him observe where the Tops of those Poles he is about to take up, grow entangled with others, and with this Hook let him cut all these gently asunder. Every Thing is to be done with Care and Caution in the gathering of Hops, and if this should be omitted, the Stalks would pull one another, and shake off the Fruit in the removing. When the Plants of the several Poles he is about to remove are thus cleared, he is to cut them off at the Bottom.

It is a common Custom to cut them near the Ground, but this is a very great Error. The Hop is in a Condition of great Strength at this Season, vast Quantities of Sap have risen for the filling of the Fruit, and they continue rising still; so that in cutting the Plant off near the Ground, a Wound is made that does not easily heal, and that bleeds a great deal to the weakening of the Root.

The proper Method is to cut them off at a Yard from the Root, and they must be taken up only as they are wanted, proportioning the Quantity taken up at a Time to the Number of Persons employed in picking.

As many Plants should be cut off at once as will find them Employment a Quarter of a Day, 'tis hazardous to venture cutting up any more, for either a hot Sun, or a Shower of Rain will do a great deal of Harm to those which are cut.

When the Plants are loosened from their Intanglings at Top, and cut off at Bottom, all is not done. They are not to be unwound from the Poles, for they twist themselves too closely, and too irregularly about them for that; the Poles are to be taken up, and the Hops picked off as the Plants are on them.

The Method is to raise them out of the Ground. Some do this by Hand, rocking

them about, and then pulling them up; but we have advised them to be too well fastened for that. Poles thus easily taken up, are but in a bad State to secure them against the Wind.

The Planter should have a large Pair of Knippers, or some other Contrivance for this Purpose, and a Block of Wood to lay near the Pole, that while the opening of the Knippers takes hold, their Handles may have the Effect of a Lever. These Knippers may be of Wood or Iron, the latter is more expensive, but vastly the better. These should be made with very long and strong Handles, and should open like a Smith's Tongs, but be well toothed on the Inside.

When they are to be used it is thus. First rock the Pole about with the Hand; then lay the Block of Wood near it: then the Points of the Knippers are to be thrust into the Ground open, to take in the Pole, and the Handles to rest upon the Block. When they are closed, and have good hold, the Pole is to be raised out of the Ground by bearing against the Block.

The wooden Instrument for this Purpose must be a large, long, and strong Lever, split and kept open at the End. There must be Iron Teeth in this open Part, and it is to be used exactly as in the former Direction.

We have observed that the Hop Poles should have a Fork at the End for the better keeping the Top of the Plant, but for the common Way of picking upon the Floor, it is best they should not; because they come the easier off when the End is single.

In the picking of Hops great Care must be taken that it be done clean, if there be any Fragments of Stalks left among them they diminish their Value. The little these Foulnesses add to the Weight, is of no Consideration compared with the Reduction they occasion in the Price.

We have given very punctual Directions for judging of the Ripeness of the Hop, as that is an Article of great Consideration; but we are not to omit observing that there is a Dispute among the Planters at what exact Degree of Ripeness it is most profitable to gather them.

We shall give the Facts as they appear upon Trial, for there is no other Way of judging. When the Hops are but moderately ripe, they are of a better Colour, and they preserve it when dry, and at the same Time they are sure to retain all their Seeds, in which their greatest Virtue lies: this has led many away at once to the resolving to gather them in this State. The Advantages are very certain, and very apparent; but let us examine the other Side of the Question.

It is true that the Hop does not dry to so fine a Colour when very full ripe, and that it naturally drops some of the Seeds; but on the other Hand, the full ripe Hop has its full Substance, which the other has not: and as it is less watery, it does not lose so much Weight in drying. Five Pounds of moderately ripe Hops yield a Pound dry, and four Pound of full ripe ones do the same. Therefore tho' the others bring a large Price at Market, yet unless it be larger by that Difference, the Advantage will be



be in letting the Hop stand to its full Ripe-  
ness.

This is the exact Fact on either Side, we have  
no more to do than to propose it: the Planter  
may now take his Choice of the two Methods.

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### C H A P. XIII.

#### *Of the drying of Hops.*

**W**E have led the young Planter through  
the whole Course of his Undertaking in  
a Hop Ground: from the preparing the Land,  
to gathering the Fruits of his Labour. His  
Hops are picked and he is to dry them. This  
is to be done by a Kiln erected for that Purpose,  
but we are to caution him in the first Place to  
be very quick in doing it. No Time is to be lost  
in the picking after the Hops are cut up; and  
when they are picked no Time is to be lost in  
drying them. Their lying but a little while to-  
gether after they are picked heats them, and the  
first Effect of this is the Loss of their Colour,  
the next is the Loss of their Smell. Few let  
them lie long enough to incur the last Damage,  
but the former is too frequent, and it is not to  
be remedied.

It may happen that the Kiln is full when a  
great many are picked and ready for drying.  
This is to be avoided as carefully as possible, by  
proportioning one Part of the Work to another;  
but if it happen unavoidably, the Method is to  
spread them very thin upon the Floor of some  
covered Place where there is a thorough Air,  
that what drying they thus get naturally may be  
regular.

A small Quantity of Hops will dry compleat-  
ly thus; and a larger will get no Damage in  
lying a Day or two; and it must be very bad  
Management indeed if the Kiln is not by that  
Time ready for them.

Nothing is so easily damaged as the Hop in  
drying: and all the Care bestowed in the raising  
of it is thus rendered ineffectual; for the Price is  
reduced at Market, and the Value also for Home  
Consumption; the Merit of the Hop is its per-  
fect Fragrance and fine Colour, and these can  
never be preserved but by the most careful Man-  
ner of curing.

Let the Planter be cautious not only that his  
Hops be dried well, but that they be all dried  
alike; and if it happen that one Parcel differ  
from the rest, in this Respect let him keep them  
separate; for one Pound of ill dried Hops,  
mixed with fifty of the best preserved that can  
be, will destroy the true and rich Smell of the  
whole.

Having delivered the Cautions in this Respect,  
we shall now lay down the Manner of doing  
it.

It is a common Practice in some of our Hop  
Countries, to dry them in a Malt Kiln, upon a  
Hair Cloth stretched out for that Service. In  
Flanders they build a Kind of Kiln on Pur-  
pose; and in some other Places they alter the  
Malt Kiln for this Use: we shall give the Planter  
his Choice of these several Ways, but not with-

out pointing out to him which deserves the Pre-  
ference.

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### C H A P. XIV.

#### *The FLEMISH Manner of drying Hops.*

**T**HE Method used by these Planters is to  
build a Kiln of Brick; which is a Room  
of about ten Foot wide: the Door of this Room  
is made on one Side, and the Fire Place is in the  
Center, and for a Room of ten Foot, it is fifteen  
Inches wide in the Clear, and so many deep, and  
its Length must be within five Foot that of the  
Room; it is to run all along the Middle, and  
to terminate two Foot and a half from each  
End, that the Person who has the Care of the  
Work may go round it: or it may be free only  
at one End for a Passage, and be made in the  
Manner of the Fire Place of our common Malt  
Kilns, the Fire passing out at Holes on each  
Side.

This Fire Place must be made on the Floor:  
and four Foot above the Top of it is to be made  
the Bed, whereon the Hops are to lie. This must  
have a Wall of three or four Foot high round  
about it, to keep them from falling off.

Adjoining to the Kiln there must be a Room  
into which the Hops are to be put when dry;  
and a Window is to open out of the Place where  
the Bed is, into this Room, that they may be  
shovelled through without Trouble.

The best Floor for the Bed is made of a Kind  
of Rails like our Pantile Laths, they are to be  
an Inch square, perfectly well planed, and they  
are to be placed a Quarter of an Inch asunder,  
that the Heat may freely pass through, and the  
smallest Hop not fall out. There generally runs  
a Beam cross the Bed in the Middle, and the  
Rails are all let into that even with its Top.

When this Kiln is prepared the Hops are to  
be thrown in as they are picked, one Basketful  
after another, till the whole Bed is full, and they  
lie a Foot and half deep upon it. They must be  
let to lie as they fall, and not pressed down any  
Way: it will be proper to draw a wooden Rake  
over the Surface, that they may not lie thicker  
in one Place than another; but this must be done  
lightly.

When the Hops are in and thus stroaked even,  
the Fire is to be kindled. In Flanders they  
burn dry Wood, and that often but of an indif-  
ferent Kind; but it is much more proper to  
use Charcoal, which we would advise the Planter  
to burn himself, with a particular Care, for that  
Purpose.

The FLEMISH Hops are commonly censured for  
having an ill Smell; and this is owing entirely to  
the Practice of burning Wood under them. Let  
the clean Fuel we have directed be used, and  
that Fault will be perfectly avoided.

The Fire must be a pretty good one, but it  
is not to be continued all along the Fire Place,  
it must be only at the Mouth of the Furnace;  
for being well kept up there, the Air which passes  
through will convey the Heat to every Part of  
the Kiln.

This Fire is to be continued till they are tho-  
roughly



roughly dry, but this must be carefully regarded, for they sometimes do not dry equally.

The Way to try whether they are dry enough is to examine them at Top; if they are thoroughly dry there they will rattle on drawing a Stick over them; and if they are thus dry in some Places, and less in others, they must be thinned where they are dampest, throwing what are taken off upon the dryest Places: thus the Fire being continued they will soon be all finished.

This is the only stirring the Hops are to have when dried thus: but the great Care is to keep an equal Quantity of Fire all the Time, that there may be throughout an even Heat. When they all appear to be thoroughly dry by their Colour, Aspect, and Rattling, they are to be tried by breaking the inner Stalk, if that snap freely they are dry as they should be; and this is a certain Rule, for till they are that Stalk never is rightly brittle.

If they are not found to be perfectly cured, the Fire is to be continued a little longer: if they be finished it is to be let out, and the Hops are to be shovelled out at the Window, into the Room prepared for receiving them. After this the Floor of the Kiln below is to be swept, and what Seeds and broken Hops have fall through the Railing, must be got together and put to the rest. Then a fresh Quantity of Hops are to be put in, the Fire is to be lighted, and the whole Procedure is to be repeated exactly in the same Manner as before.

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#### C H A P. XV.

##### *The Way of drying Hops in a Malt Kiln.*

**T**HIS is a Method of drying them, which comes much easier than the other, where there is a Malt Kiln in readiness, because the Fire Place there is made to serve, and the Trouble and Expence of a particular Building is saved.

We shall not, in this Place, describe the Structure of a common Malt Kiln, that is sufficiently known; and we shall also have Occasion to speak of it particularly hereafter in its Place. The Manner of employing it for the drying of Hops is this: a Hair Cloth is to be used as a Bed for the Hops, and they are to be spread upon it six Inches thick.

They are thus kept over the Fire made in the usual Way, till they are about half dry; then they are turned with a Scoop made for that Purpose, the lower Part upwards, and the upper Part, which was least done, lowest; thus they are to lie till the whole Quantity is thoroughly dried.

When they are done the Hair Cloth is removed, and they are thrown into a Room; where they lie ready for bagging. This is the Method of drying Hops at the Malt Kiln; in Favour of which nothing can be said, but that for small Quantities, where there is a Malt Kiln near, it may be convenient to save the Expence of a Building erected on Purpose.

The Hop Branch however is so profitable, that we shall advise the Farmer to set out in it boldly, taking a large Ground, and not sparing the first

Expence in any needful Preparations. So that this Expedient will be of little Service to him, wherefore we have treated of it more shortly.

For those who find it proper, according to their particular Occasions, this Caution is to be given them, that they take great Care in the turning, to do it gently; and that they use clean Fuel; and keep the Heat uniform and equal during the whole Time.

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#### C H A P. XVI.

##### *Of drying Hops in a Malt Kiln fitted to the Purpose.*

**W**E have shewn the universal FLEMISH Way of drying Hops; and that Method of doing it in ENGLAND by the Malt Kiln and Hair Cloth; both are used, and may answer, but we are here about to propose a better Method, which is by preparing a Malt Kiln for that Purpose: and before we enter on its Advantages it may be proper to shew the Inconveniences of the others.

As to the FLEMISH Way the Fire must be continued longer than in any other, because there is so large a Body of Hops to dry; and as they are never turned, the under ones must be more done than the upper, and must be over-done in the drying the upper ones sufficiently: therefore there is more Time, more Charge in watching, and more Fuel than need be; and the greater Part of the Hops are too much dried, by which they lose both Weight and Colour, so that they are doubly the worse, while the Expence is greater.

In the Way by the Malt Kiln and Hair Cloth, the Necessity of turning is a great Trouble and Inconvenience, for many of the Hops are shattered and broken, to which not only the Motion of turning, but the Roughness of the Hair Cloth contributes; and a great deal of the Seed is scattered and lost by the Motion. Perhaps these are less Inconveniences than those in the FLEMISH Way, but they are very great ones notwithstanding. We have said before, that a great deal of the Virtue of the Hop is in the Seed, therefore this is a great Damage; and the breaking the Hop always injures the Price at Market.

We see the Inconveniences of these several Methods, therefore let us consider whether they cannot be guarded against; and whether a Way of drying may not be found, which shall have all the Advantages attending this Method, without the Damage of either.

This is what we shall attempt in the Method which we are about to recommend: it has been practised in some Places many Years, and the Advantages of it are so great that 'tis pity it should not be universal. To this Purpose let there be a Kiln, the lower Part of which shall be, in all Respects, the same with that of a common Malt Kiln; therefore a common Malt Kiln may be used for this Purpose, with the following Additions, or there may be one purposely erected in the same Manner.

When the Kiln is thus far prepared, the Bed for the Hops is to be thus made. Frame together



ther a Quantity of Slips of Deal well planed, let them be three Inches broad; one Inch thick, and of such Length as suits the Kiln, and the Quantity. Let these be laid Checkerwise one over another, at four Inches distance; let those which lie uppermost be let into the lower, and the whole Surface kept smooth and perfectly even. This Frame must be supported by Joists set Edgewise, and so placed as to lie in a true Level.

Then prepare a Covering for it, of that strong Kind of Tin called double Tin; let the Measure be carefully taken, and the Plates of Tin well foldered together, and let the laying of the several Plates be so contrived, that the Joints fall upon the Middle of the Ledges.

When the Frame is well tinned let there be four Sides of Boards made to it. Three of these are to be fixed, but the fourth must have Hinges: it is to be hooked up in the Time of using; but when the Hops are dried and are to be removed, it is to be let down, so that they can be pushed gently off without breaking.

When the Bed is finished let there be a Cover prepared for it. This must be exactly of the same Length and Breadth, it must be made of Boards, and framed together; the lighter the better, so it will be able to support its Extent. The Face of this must be covered with Tin Plates, laid on evenly, which will be very easy, the Boards being planed.

This Cover is to be hung flat from the Roof of the Kiln, at a considerable Height above the Bed, but so contrived that it may be let lower upon Occasion; in the Time when it is wanted. The Bed being thus prepared, and its Cover hung over it, Conveyances for the Smoak must be made at the Sides and Corners of the Kiln, and then the whole is ready.

Some Expence there is in fitting up this Kind of Kiln at first, but it very richly answers. Less Time and less Fire are required, and almost any Kind of Fuel will serve.

We have observed that in the FLEMISH Way there is a great Error, in using raw Wood or any other foul Fuel, but in this Method that Caution is not necessary. Then the Smoak or Vapour of the Fuel lodges among the Hops as they are drying, because the Bottom of the Bed is open; but here, as that is covered with Tin, the Vapour never gets among the Hops at all.

We have shewn the Construction of this Kiln, we shall now proceed to the Manner of using it. We suppose a Parcel of Hops picked and ready for drying, let them be carefully emptied into this Bed by Basketfuls, and spread a little about by the gentle Motion of a Stick, in the Hand of a Person who can go along the Sides of the Bed, and from one Part or other reach over it; the Hops are thus to be spread about till the Bottom of the Bed is covered eight Inches deep with them pretty evenly; this done the Fire is to be lighted and kept up equally, till the lower Part are dry, and the greatest Quantity of the Moisture is evaporated from the whole.

Then let the Cover be gently let down till it comes within ten Inches of the Surface of the Hops, the Fire being all this Time continued as at first; the Effect of this Cover will be like the

N<sup>o</sup> 40.

Dome of a reverberatory Furnace, it will reflect back the Heat of the Fire upon the Hops, in such Manner that the top Part shall soon be as dry as the Bottom.

When all are dry enough the hinged Side is to be let down, and being supported slanting downwards with a gentle Descent from the Level of the Bed, the Hops are to be pushed out carefully with a Board at the End of a Pole, and the Side being put up again all is to be continued in the same Manner, with a fresh Parcel of Hops.

To save the Expence of this Cover, a flat Scoop may be used to turn the Hops when they are two thirds done, but this is some Labour, and all Motion, as we have shewn, hurts the Hops; the Expence of the Cover need not be any thing like that of the Bed, for rough Boards will serve, and common Tin Plates nailed on will perfectly well serve for the facing of it. In this Manner the Price is moderate, but if it were much more it would be easily saved in a little Time, in the Advantage the Hops get by drying without turning.

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C H A P. XVII.

Of the bagging of Hops.

OUR young Planter shall not be left at a Loss in any Part of his Business, he has seen the Hop raised, picked, and dried, which last is the most nice and most expensive Article of all; and we shall proceed now to the packing them up in Bags, after which they are out of his Hands.

We have directed that when Hops are to be dried, a Room is to be prepared for receiving them from the Kiln. This must be dry and airy, and there requires no farther Care.

The Hop being kept whole and clean, is a great Article in its Value: for this Reason, as well as many others, it is not to be packed up directly from the Kiln, for it is then very brittle, and would break in such a Manner as to foul one another, and be full of Fragments. This would greatly reduce their Price. Beside, they would have too much Heat among them, and this not going off freely would damage them. For this Reason they must lie in this Room till they have thoroughly cooled; and they will, in that Time, grow so tough and firm that they may be pressed in packing without Fear of hurting them.

Three Weeks is the least Time they should lie for this Purpose, and according to the Season, and other Accidents, it will be proper sometimes to allow them a Month or longer.

If the Weather be moderate they will come to a proper Toughness very well, lying open; but if it be very hot and dry 'tis best to spread Blankets over them. So tender a Thing as the Hop very well perceives the Difference of Seasons within Doors.

The Room into which the Hops are received from the Bed of the Kiln, should be pretty near the same Level with the Bottom of the Bed, that the Hops may not be hurt by falling too far:

this also answers another Purpose in the bagging; for being at this Height there may be another Room under it, which is quite necessary for the managing that Matter.

In the Middle of the Floor of the Room into which the Hops are received from the Kiln; there must be opened a Hole communicating with the Room underneath. This must be four Foot long, and three and an half wide. The Bag into which the Hops are to be received must have a Hoop fastened to its Top, the Edge all the Way round being turned over the Hoop, and fastened with Packthread in a large Needle. This Hoop is to be of such a Size that it cannot go through the Hole.

The Bag being thus prepared is to be let thro' the Hole, the Hoop supporting its Top remaining above; and this is to be very well fastened in, because it is to bear all the Weight and Force in the treading.

The Bag being let through, toss in a small Quantity of Hops, and then going into the lower Room, gather up some of them to the Corners, and tie in a small Parcel into each Corner, with a Packthread put strongly round. These resemble Tossels or Pincushions, and are very serviceable afterwards in managing the Hops.

When this is done let more Hops be thrown in, and let the Man who packs get into the Bag, dispersing them evenly, and treading them down as fast as they are thrown in: this is to be done till the Bag is full.

When this is done the Bag is to be unripped from the Hoop, and its Top sowed firmly together, making a couple of little Bunches at the Corners, as there were at the Bottom. This finishes the Management of the Hop; for in these Bags they are ready for the Market, and if the Owner have a Mind to wait for a more favourable Time for selling them, they will keep ever so long in a dry Room without Damage.

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#### C H A P. XVIII.

##### *Of the Management of the Hop Ground after the Hops are gathered.*

**W**E have set out with supposing our Planter to begin his Work from the Ground, and have carried him through the first Season. We have therefore yet given few Directions for the managing an old Hop Ground, our Subject having been a new one. We shall here enter upon the Care of the Ground after the Crop is gathered, and this will lead us to that Conduct which is necessary in Plantations that have been sometime established.

As soon as the picking is over clean off the Stems of the Hops from the Poles, and lay them up dry for another Year, the best Way is to place them in a Heap under some Shed. In large Grounds 'tis worth while to erect a Shed for the Season of picking, that this may be done under Cover; and the same Building will serve for keeping the Poles till Spring. Some raise them in Heaps hollow within, and standing like a Pyramid, but the Outside Poles are damaged

in this Way, and the Tops of all. Others lay them in Heaps exposed, only spreading the dry Plants over them, but this rots them. The Method of housing them is much better; and the Poles come so dear, and the Shed may be raised for so little, that 'tis worth while to do it only for that Purpose.

As to the Hop Ground, that is to be left untouched till Spring: but it will be needful to give it a good Dressing then, and therefore the Manure should be got ready during the dead Season. As the Planter used a Compost for the receiving his Sets at first, so he is to follow the same Method in dressing the Ground afterwards. Then let him be sure to remember, on all Occasions, Hops will be very much improved by Dung; but they cannot bear such as is new: it will utterly destroy them. Upon the proper Condition of this Manure, and the due dressing of the Ground by Tillage, will depend the Success of the next Year.

It is in the Planter's Choice to have a moderate Crop, or three Times as much, according to his Diligence and Conduct; and it is possible, by Neglect or Mismanagement, not to have a third Part of what would naturally come.

Mix ten Load of Dung, that is at least a Year old, with two Load of common Garden Mould; and half a Load of sharp Sand, stir and work all this thoroughly together about NOVEMBER, and let it lie till Spring.

The last Week in MARCH plow the Ground lightly over, then bring out all the old Haulm or dry Stems of the Hops that were taken off the Poles the last Autumn, lay it in Heaps in different Parts of the Ground, and let Labourers shovel some of the Surface of the Ground upon the Heaps. Then set them on Fire and reduce them to Ashes. These Ashes will lie in Heaps, and let the Compost laid together in NOVEMBER, be brought into the Ground, and equal Quantities of it laid on every Heap. Let a Labourer mix the Earth and Ashes with the Compost, and this becomes an extremely rich Manure, and agrees perfectly well with the Hop, though a difficult Plant.

As soon as this Mixture is prepared, which will probably be within the Week, or in the very Beginning of APRIL, let the Hills be opened, and they are to be refreshed with it.

Let it not appear strange to the Planter, that we advise the setting about dressing the Ground so late as in the Beginning of APRIL. We are sensible it is the Custom of many to do it earlier, but Experience has shewn us this Time is much better. The Hop is a Plant that shoots late, and 'tis happy for the Planter that it does; for when a forward Spring brings the Shoots early, there generally happen some Injuries to them. This late dressing keeps them backward in springing, and at the same Time thoroughly destroying the Weeds so late, they do not rise of a considerable Time.

These are the Reasons for late dressing the Hop Ground: the Manner of doing it is this. The Hills are to be one after another pulled down, and the Roots examined. These are of two Kinds, the old and the new; the old are all to be preserved, and the new, which shoot Sideways

are



are to be cut away. The old Roots are reddish, and the new are white, so that the Colour easily distinguishes them.

But let the Planter remember that it is not all the new Roots which are to be cut off, but those only which shoot sideways. Such as run downwards are to be preserved.

The same Discretion is to be used with the Shoots, the old Sets are to be preserved, and here and there a good young one that is well placed, is to be left on with them, the rest are to be taken off; they are ready for planting in new Ground if wanted, if not let them be thrown away.

When the Roots and Sets are thus cleared and prepared, let the Earth that was taken from them, and that removed by the breaking of the Hills, be thrown into the Spaces between the Hills; and let the Hills be made up to a due Height, with the mixed Compost and Ashes, and calcined Earth, which together makes an excellent Manure. The young Shoots are to be cut off at an Inch from the old one this first Dressing, but every Year afterwards they must be cut away close.

It will often happen that the Set of a good Hop degenerates into a wild Kind; in this Case let the Hill where this stood be marked at the Time of gathering; and at this Spring dressing let it be entirely taken to pieces, the former Sets removed, and some of the best of those produced by the good Kinds be planted in their Place. The Hills must not be made too high at first, because the Ground is to be pared in the Summer, as directed before, and these Parings are to be laid upon the Hills; so that if they were too high at first they could not bear this Addition, the Use of which we have shewn already.

As we have advised the dressing the Ground so late, the new Planter may be startled to find some of his Hops up when he sets about it: he is not to regard this, but to go on with his Work. The cutting off a Top at this Season does no Harm: but this being once done, and the Hills made, let him take Care no Injury is done to them afterwards. All Vermin and all Poultry are to be kept off, and of all Birds he is to be the most aware of the Goose, the greatest of all Enemies.

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#### CHAP. XIX.

##### *Of dressing an old Hop Ground.*

**T**HE Hop Plant comes to its full Vigour the third Year, and it will last a great while; but Time will wear out the Strength and Heart; and sometimes Neglect will bring the Ground in a few Years to the Condition it would have fallen into necessarily after its full Period.

In either of these Cases the same Method is to be followed. In this Circumstance the dressing of the Ground must be begun in Winter, not staying till Spring. First let the whole Space between the Hills be plowed up with a four coultered Plow, that it may be cut deep and

thoroughly broken: and let there be in readiness some of the Compost before described. When the Spaces are thus broken up, let the Hills themselves be pulled down as far as can be with Safety to the Plants, and let their Earth, and some of that which is nearest them in the Spaces, be thrown to a Distance, and bring in the Compost to supply its Place all about them.

This deep plowing will destroy the Weeds perfectly, and the Addition of new Stuff will give the Hops the Advantage so far, of not only new Ground, but very rich Ground.

There is also another Advantage in this Method, which may be understood by the Principles of Husbandry before laid down; this is, that the Hop is at once encouraged to send out new Roots, and Nourishment is provided for them.

To explain this perfectly, let us set before the Reader the real State of a decayed Hop Ground, as it would appear if the whole were exposed to the Eye.

Here are a Number of Hills with strong old Plants upon them, and here is a great Extent of Ground between and about them, which is hard and firm, at least it is so at a little Depth.

The Surface of this Ground may have been stirred to four, five, or six Inches deep, but never more since the Ground was made: under that it is perfectly hard; as if never broken by any Tillage.

The Roots of the Hops we have shewn do not spread near the Surface, nor should be suffered much to do so. Their common Way is to strike deep into the Earth, and there to spread every Way to a great Distance. This is their natural Course, and in this they should be encouraged; now let us consider what is the Case of an old Hop Ground. The Roots have gone their Depth, and they cannot spread because of the Hardness of the Ground between. The Earth in the Hills is all they have any Advantage from, and that in general is renewed too superficially.

In this Case the Hop sends its Roots but a little Way, and they lie in an Earth they have long before exhausted. This is the Occasion of their Decay. We see that by removing them into a new Ground, the same Plants succeed greatly, Nature therefore is not exhausted in them. We have shewn how they come to lose their Vigour: and we have said at first, that at such Time the common Practice is to set them in a fresh Ground, that in which they stand being worn out.

We have set this plain State of the Case before the Planter, to shew him that this is the Occasion of the wearing out of the Ground; and as we are about to propose the renewing it by Tillage instead of giving it up, we shall shew the Reasons.

We have delivered the Caution of planting the Ground with Fruit Trees in Time: so that the Person who chuses to give up his Ground at the End of ten or a dozen Years, may do it to the best Advantage: but we here shall give him the Choice of restoring it to its Vigour, and continuing it in Strength from Generation to Generation.





## C H A P. XX.

*Of restoring a decayed Hop Ground.*

**I**N the Condition wherein we have described the Hop Ground, the common Practice is to give it up; and this was very reasonable upon the old footing of Agriculture, in which nothing was known but by Memory; Men practising what they had seen done before, and understanding nothing of what they did by Method. Now we are upon a new and better System.

On taking up a Root of an old Hop Plant in one of these decayed Grounds, the Fibres hanging from it will be found few in Number, large, and often mouldy, or otherwise decayed at their Ends. This is a State in which they can support the Plant but very poorly. The large Roots in all Growths serve to receive the Nourishment from the small ones, and convey it to the rest of the Plant; but 'tis the small ones that absorb it from the Earth. There are few of these, therefore the others in a Manner lose their Use, and the Plant is very poorly nourished. There are no small Roots to penetrate into the Ground, nor any Ground in a Condition to receive or supply them with Nourishment. Therefore to restore the Hop Ground to its old Vigour we must do two Things, and no more are necessary; we must occasion the Plants to send out more Roots, and prepare the Land to give them free Passage, and afford them Nourishment.

How we shall go about to make the Plants send out new Roots, the common Practice of every Gardener shews us. When he is to remove a Plant of whatever Kind, he cuts off the Ends of all the Roots before he sets it in the new Ground. The Effect of this is, that there immediately strike out a great many new ones; and these being small are in a Condition to imbibe Nourishment.

The other Article may be learnt also by the same familiar Example. When the Gardener has cut off the Ends of the Roots, he opens a Hole and stirs up the Ground about the Place. This disposes the Mould to give free Passage to these new Roots, and to afford them Nourishment.

Now let us apply the Principles we have before delivered, and this familiar Example to practise in the restoring a decayed Hop Ground.

We say the Earth is exhausted, but that is a Mistake. The greater Part of it, that is, all in the middle Parts of the Intervals, lies hard and unpenetrated, and has done so for many Years, no Roots have got into this at any Depth, therefore this is not exhausted. Now the Earth about the Hills being exhausted, is to be removed, and fresh and better Matter to be put in its Place, and the other being thoroughly broken and divided by the four coultered Plow, will be ready to serve as new Earth in all Respects.

In plowing the Ground let the Plow come as near to the Hills as it can, and cut to the full two Spit Depth, particularly in those Places. This will cut off the Ends of all those Roots

which shall have penetrated so far within that Depth, and the Ground being rendered light and fine by the breaking, will be ready to receive freely the new small Roots they shall shoot from their Ends, and to afford them Nourishment. In the same Manner the Spade will, in digging down the Hills, cut off the decayed Ends of those shorter Roots which never extended beyond the Hill; and not only a well broken Earth, but a perfectly new Earth will be added here for them to strike into, and for the supplying them with Nourishment.

Thus by this double Management of the Hills and the Spaces, the Roots will be nearly all cut off at their Ends; they will be put in a Condition to send out new ones, and there will be Earth all about them to receive and supply them with Nourishment; and this is all that is required for the most perfect Growth of every Plant.

We see therefore in Reason, that a Ground thus treated ought to yield as well, and indeed better than a new one, because of the established Growth of the Sets: and I may almost venture to affirm, that it will answer exactly so in Practice. What I am proposing to others I have tried myself in little; and am now practising at large. I mended one Corner of my Ground in this Way, and it answered to the utmost Expectation: I am now trying the same Course in the whole Ground, and have no Reason to doubt but the Success will every where be equal.

When the Ground is thus run to Decay no Method is so good as using the four coultered Plow, because of the Depth to which it cuts, and the perfect Manner wherein it breaks the Furrow: but when the Ground is once restored this Way, the common Horsehoe or Hoe Plow, called the Horse-Break, is fully sufficient. This is a new Practice, but it is founded on Reason, and supported by Experience in other Growths, nor can there be the least Doubt of its full and entire Success, according to the Promise of the Trial I am now making.



## C H A P. XXI.

*Of watering a Hop Ground.*

**T**HERE remain yet some few Particulars to be mentioned, as to the Management of a Hop Ground; and these as they are not general, and at all Times necessary, we have referred to this subsequent Place of Consideration, that we might not break the Chain of necessary Works in every Ground, and for every Season.

The Principal of these accidental Articles is watering. It is not necessary every Year; and happy for the Planter that it is not, for 'tis a Business of great Fatigue; but sometimes, whatever be the Expence or Labour, it will be found worth while to do it.

This depends upon the Seasons. When Nature follows her usual Course the Planter must give himself no Trouble to assist her; but he is to know what Assistance she should afford, and when that is wanting he is to assist her by Art.

Thus Spring is a Season in which there are Showers,